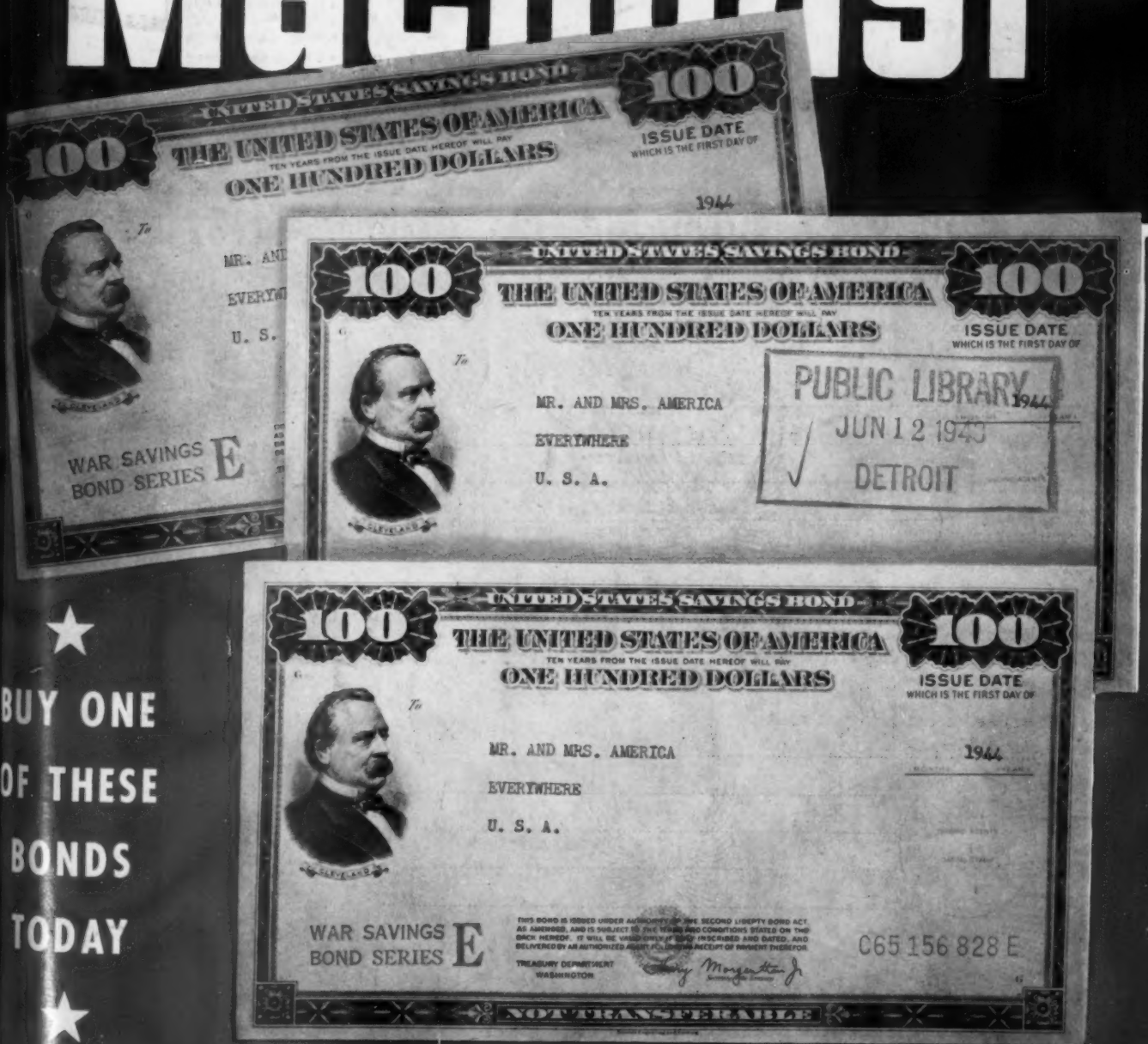
JUNE 8, 1944

American Machinist

TECHNOLOGY DEPT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Do all these Precision Jobs
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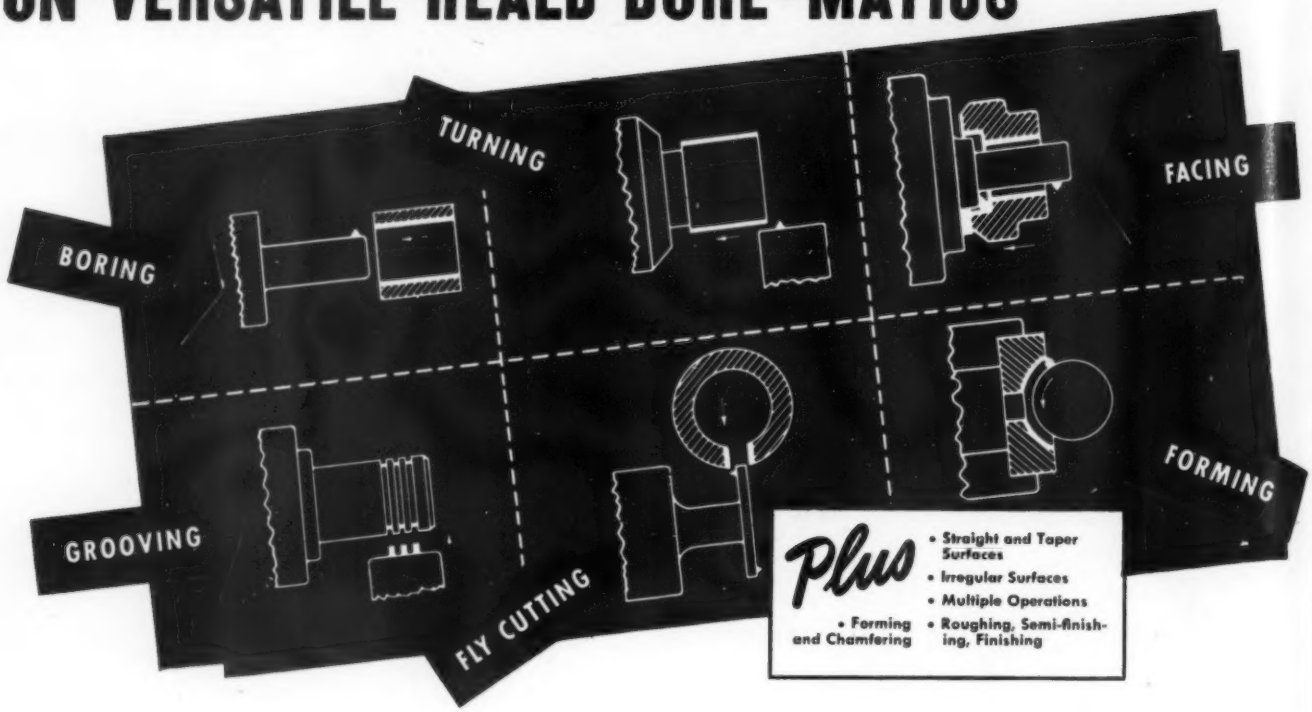
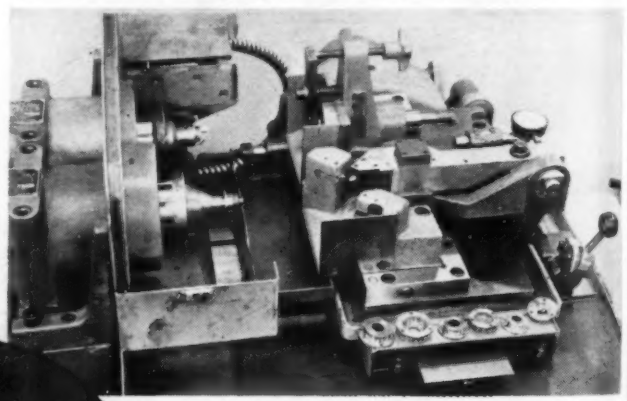


V. F. 1* *ALL-PURPOSE* VERSATILITY *FOR ALL APPLICATIONS*

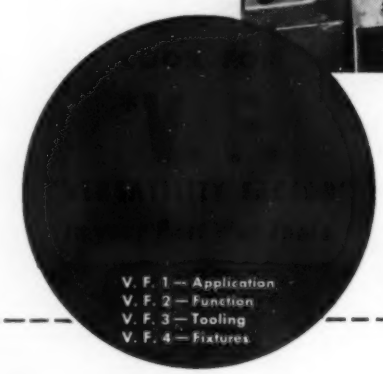
Here's a way to hold size, roundness, straightness to tenths . . . get perfect squareness, concentricity, alignment . . . produce better finish, reduce or even eliminate final lapping and honing . . . boost production, lower costs . . . *this way*—Borize on *Bore-Matics*.

Such results are not limited to just one type of operation. Heald Bore-Matics are all-purpose tools—for all kinds of jobs, for all types of operations. Unusual flexibility gives them unusual *versatility*, makes it possible to execute boring, turning, facing, chamfering, grooving with equal efficiency. Either straight or taper surfaces can be machined, and also curved and irregularly-shaped surfaces. These operations can be accomplished singly, simultaneously, progressively or in combination. Nor are operations restricted to final finishing—roughing and semi-finishing can be done, too.

Heald Bore-Matics can help you meet postwar competition, aid in creating new postwar markets—thru more precision, more production on all vital operations. Get the Bore-Matic story, now . . . The Heald Machine Company, Worcester 6, Massachusetts.



Borizing Gun Housings. Six operations—turn, face, chamfer, bore. Two stations. Single end operation. Rotary and stationary fixtures. Compound feed, table and cross-slide. Automatic cycle. Such versatility in Bore-Matic design permits ready adaptability to the exact requirements of every job.



HEALD *Bore-matics*

THE MOST VERSATILE MACHINE TOOL

American Machinist

June 8, 1944

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To _____

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Signed _____

American Machinist Chips

New Feature . . . We call your particular attention to the new Reconversion Section which started in the previous (May 25th) issue of this journal. *American Machinist* has been—and will continue to be, so long as the need exists—one of the country's leading sources of armament production data. Practically everyone realizes, however, that vital problems of peace are being superimposed on our No. 1 job of producing for war. Planning ahead is good business anytime, urgent business now.

If you haven't already done so, we urge you to read this article carefully, and we sincerely believe that you will find in this continuing series many of the answers to your current and coming reconversion problems.

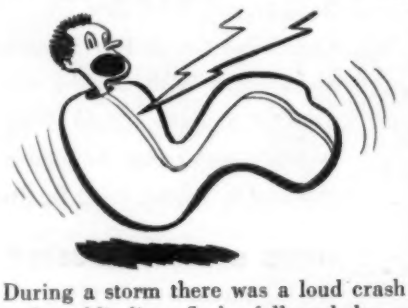
Also worthy of special note in the previous issue was the Tooling Dock article by Jack Haydock, *AM's* Managing Editor. What the airplane has done to transportation, the tooling dock has paralleled in the field of assembly tooling. Described was the installation at Consolidated Vultee. This has been rated one of the best and most significant stories yet to come out of Jack's extensive reporting on the West Coast, and we submit it as one more indication of alert editing that makes your subscription to *American Machinist* worth more to you every day.

Big Stuff . . . United Engrg. & Fdry. Co. recently built what is said to be the largest hydraulic press ever constructed. It exerts a maximum pressing force of 14,000 tons, has a working stroke of 10 ft. and is 74 ft. high overall. It is also notable for its high eccentric load capacity, being capable of a full load at 6 ft. off center, due to a novel design.

Neat little gadget—just the thing to have around the house.

Civilian Production . . . International Harvester stated recently that their war output during the first half of their current fiscal year had declined. At the same time, output of farm tractors, implements and service parts more than doubled that of the same period a year ago. Some 20,000 trucks to be made for civilian use this year are expected to contribute to the rapid growth of civilian production.

Weld, Weld . . . From the *Hobart Arc Welding News:* "Soldiers of the Second Army on maneuvers recently in Tennessee witnessed a neat job of welding.



During a storm there was a loud crash and a blinding flash, followed by a shriek from a soldier who had been asleep. Lightning had struck the zipper of his sleeping bag and had run all the way around it—welding him in securely but unharmed."

Metal-Working Tomorrow . . . We have been commenting for several months now on the additions to our new "Metal-Working Tomorrow" family of forward-looking articles. Lots of reprints have been requested, but in case you haven't gotten around to it, you will find a convenient coupon at lower left to use in ordering your copies. Come one, come all!

Schenectady Diet . . . Invisible platinum wire, so small only its shadow can be seen, is being used experimentally in the General Electric Company's laboratory. Some 25,000 strands would be needed to equal the cross sectional area of a human hair.

Maybe GE can give the "size 42 ladies" some hints on slenderizing.

What's Ahead . . . We received from The Wearwell Cycle Co., Ltd., an English firm, a letter that gives an indication of what will face Metal-Working in reconstructing a war-torn world. We quote:

"As we had our polishing plant and plating plant completely destroyed in the blitz, we wish to start getting together details of the latest improvements and attempt to make out specifications we shall require, as we wish to start purchasing equipment as soon as hostilities cease.

"We shall be glad, therefore, if you can let us know the names of any manufacturers of polishing plant and plating plant equipment suitable for the following:—Cycle handebars, rims, straight tubes, bell domes, chainwheels and cranks, etc."

AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

Please send me, at 10c per copy, the following:

——Copies of "What's Ahead in Heat-Treating"
——Copies of "What's Ahead in Finishing"
——Copies of "What's Ahead in Lighting"

Name .....

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BEVEL GEAR DRIVES — TO *Victory*

Bombsights depend on fine-pitch bevel gears like these for their accuracy.

Official U. S. Air Force Photo, *Signal Corps - International*

PRECISION BOMBING BY MECHANICAL BRAINS

Modern U. S. bombsights are responsible for the deadly accuracy of our Air Forces' high altitude bombing which is hastening the day of victory.

Once set exactly on the target by the bombardier, these bombsights perform virtually as a mechanical brain, automatically taking into account all variables and capable of dropping a bomb from 20,000 feet into a "pickle barrel."

BEVEL GEARS CONTRIBUTE REQUIRED ACCURACY

When this mechanical brain is set on the target and takes control of the plane, moments are tense and success of the mission depends upon its perfect functioning. Absolute synchronization and smoothness of motion of all parts is essential. It is here the accuracy of the gears in the mechanism counts.

Super-precision bevel gears, designed by Gleason engineers and manufactured in accordance with improved Gleason production techniques, have successfully met every such action test.

These bevels are cut to extremely fine tolerances for pitch line concentricity and tooth spacing. The method of tooth generation on latest Gleasons gives the accuracy of profile and high degree of surface finish necessary for the smooth operation of the unit.

Quick assembly with zero backlash is possible by virtue of the axial adjustability of bevels. This advantage is of great value, especially in the case of differential applications in the mechanism.

CUT ON GLEASON MACHINES

Mass production of these super-precision bevel gears is accomplished on the Gleason 3″ Generators, aided by essential Gleason auxiliaries.

Bevel gears are important parts of many other control instruments for peace as well as war. Gleason engineers will be glad to help you design bevels for these applications and select machines for their manufacture.

GLEASON WORKS

Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER 3, N. Y., U. S. A.

HYDRO-TEL automatically mills FOUR PROFILES at the same time

THE 360° AUTOMATIC PROFILING UNIT DOES THE TRICK • • • •

Now, a 360° Automatic Profiling Unit may be built into CINCINNATI Hydro-Tel Millers for work requiring the milling of complex external or internal profiles. A tracer finger, extending from the bottom of the unit, accurately follows around the contour of a master template, releasing hydraulic power to the table and cross slide hydraulic circuits. In effect, this unit guides the milling cutters around the work in the same path as the shape of the master template. ¶ The illustration on the opposite page shows a CINCINNATI 28" Vertical Hydro-Tel Miller equipped with the 360° Automatic Profiling Unit, a four spindle head and fixtures for two banks of parts. You will notice a template for each fixture. While one series of parts is being milled, another is loaded. The table is then rapid traversed to the right, the tracer finger positioned and the second series milled. Think what this arrangement does to a production problem! ¶ Perhaps you have jobs requiring 360° profiling that could be milled to better advantage on such a setup. The engineers here at Milling Headquarters will be glad to talk it over with you.

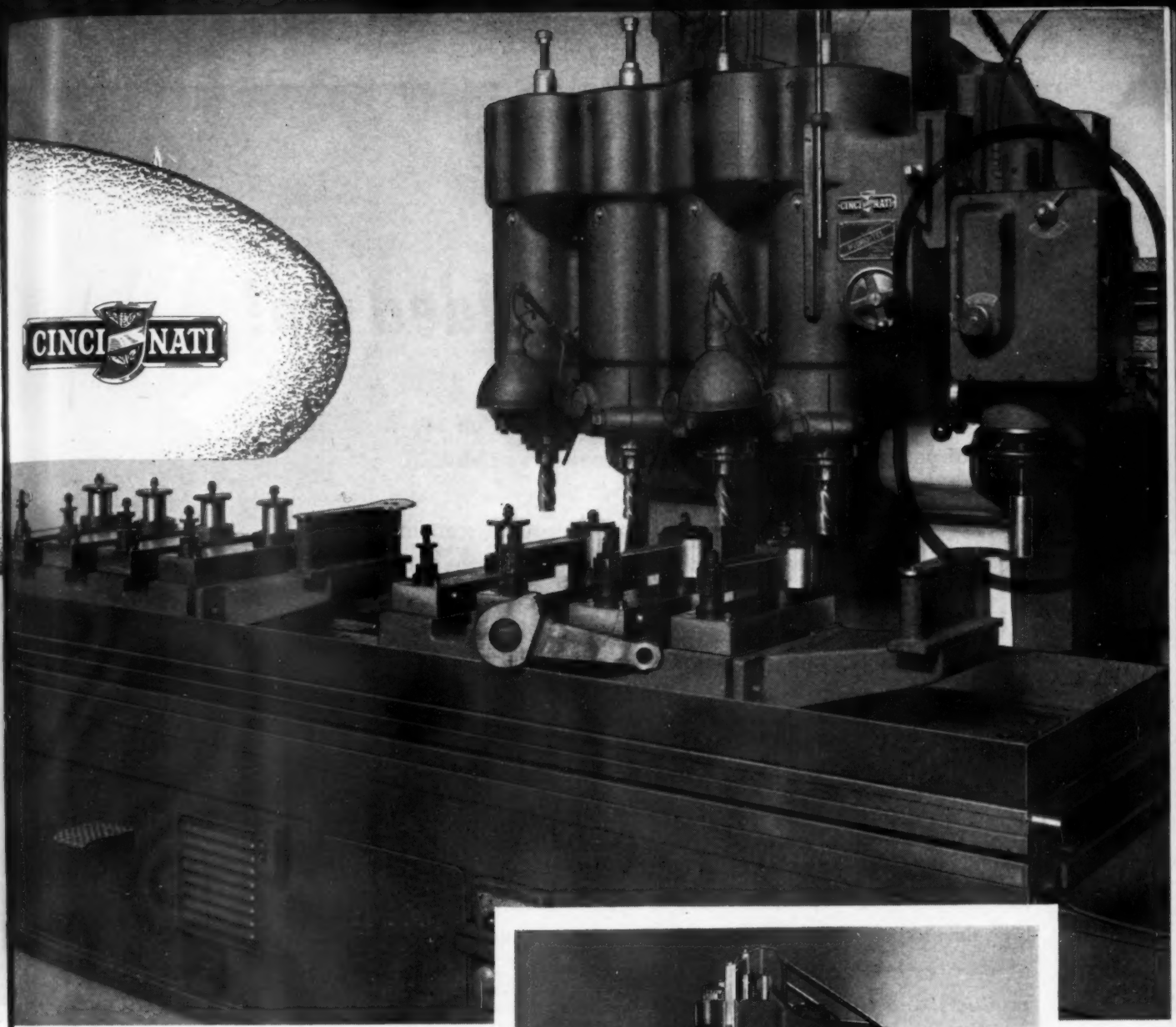
★ ★ ★ ★ ★ ★ ★ ★ ★ ★

Keep on buying WAR BONDS

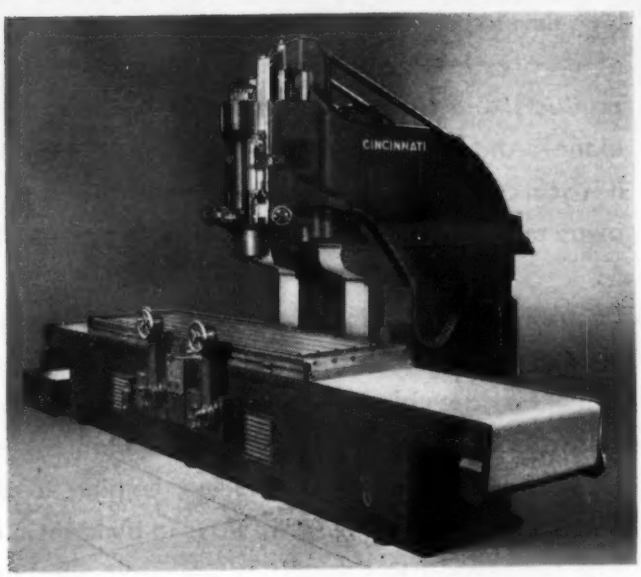
★ ★ ★ ★ ★ ★ ★ ★ ★ ★

THE CINCINNATI M

MILLING MACHINES



Above: The 360° Automatic Profiling Unit is circled in color. More information about this CINCINNATI *engineered 360° Automatic Profiling Unit and specifications for* CINCINNATI *Hydro-Tel Milling Machines are given in catalog M-1284. A copy of this book is yours for the asking.*



Right: CINCINNATI *28" x 60" Hydro-Tel Milling Machine. For a brief description of this Miller and all other* CINCINNATI *Milling Machines, look in Sweet's Catalog File for Mechanical Industries.*

MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

The day New York folded up!

It was not good at all. The whole city just folded up like a stack of potatoes. No reason. Just collapsed. It was bad.

"This is bad," said a usually well-informed source standing amid the ruins. "In fact, there's only one thing good about it."

"What's good about it?" said a voice from under a mass of office equipment and misses' wearing apparel.

"It demonstrates a very important fact," he mused. And then he explained it all this way:

If the entire city of New York should suddenly collapse, that would represent the loss of about 21 billion dollars' worth of property . . . Now it took America's machine tools a powerful long time to produce a lot of that stuff—yet the entire contents of the city of New York adds up to less buildings, equipment, products and gadgets than will be sold in the year 1946 alone!* And 21 billion dollars represents a lot of buying—yet it is scarcely *one-third* the buying power that has been stored away *already* in the purchase of U. S. War Bonds!

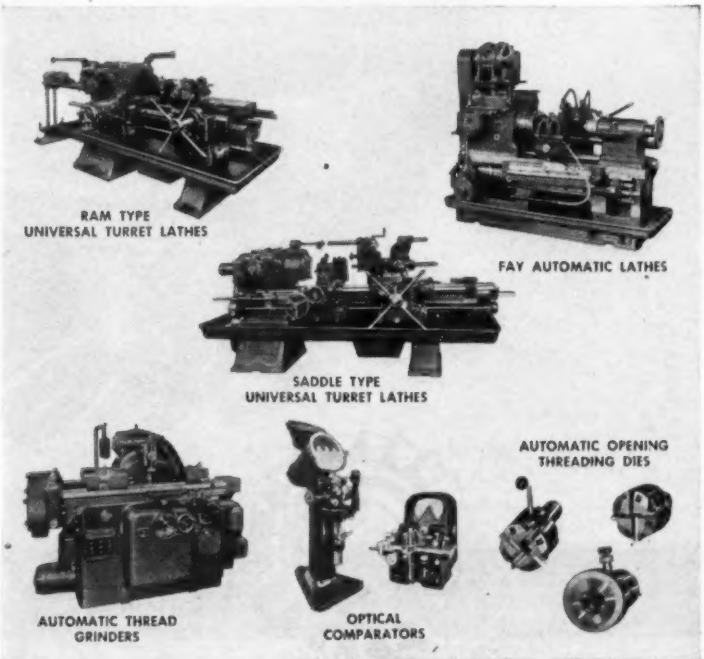
Do we make the point? Machine tools are going to be very very busy after this war. We know, because Jones & Lamson engineers are already very very busy—working behind closed doors with the designers and planners of America's leading manufacturing companies, helping to develop *now* better products and cheaper ways to build them in the era of fast competition to come. They are at your service, too.

**Based upon a Department of Commerce estimate, assuming that the war and immediate conversion period will be over by 1946.*

PROFIT-PRODUCING MACHINE TOOLS . . . . .

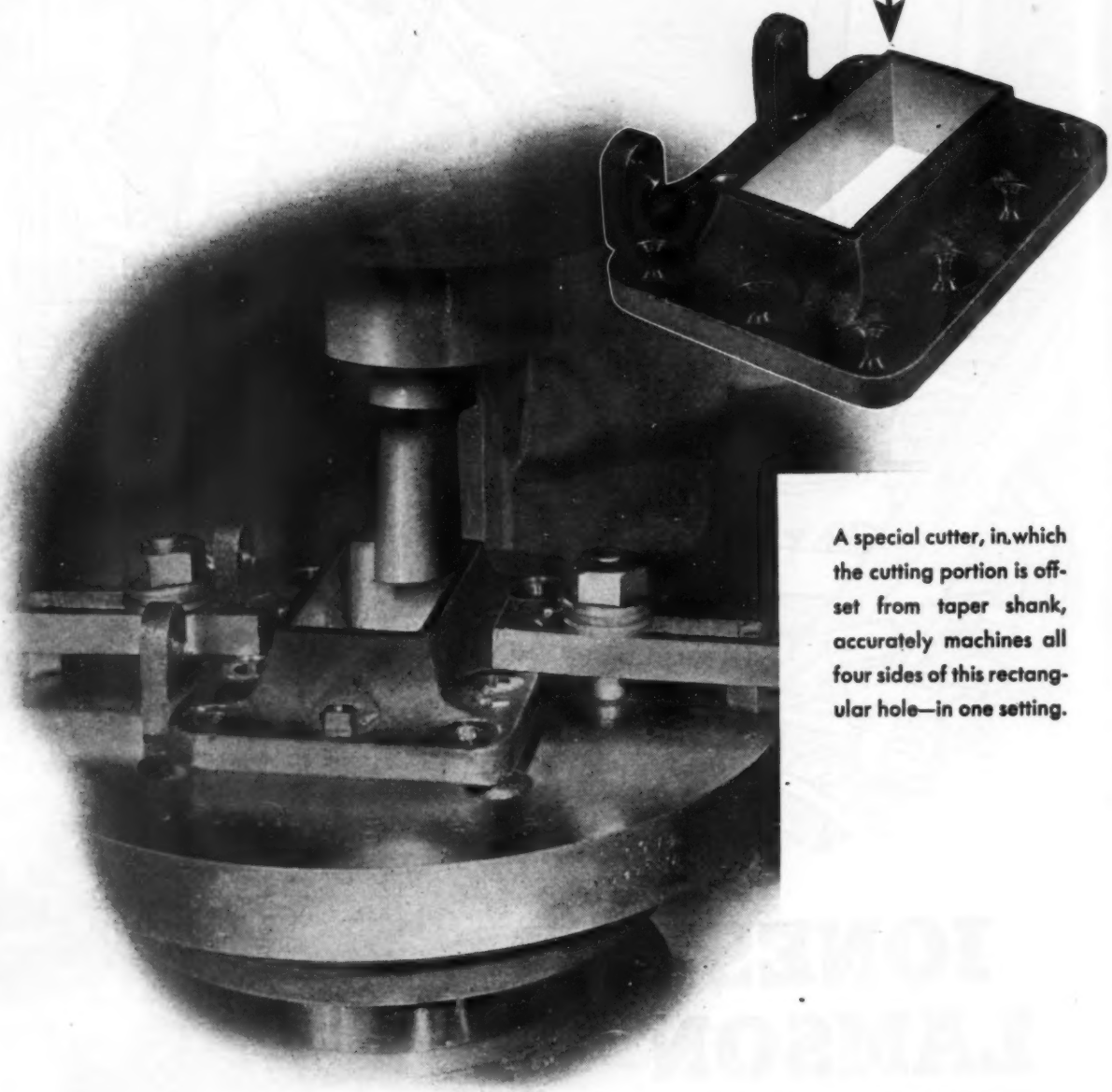
JONES & LAMSON
MACHINE COMPANY
SPRINGFIELD, VERMONT, U. S. A.

Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.



THE Broad Usefulness OF

SOLVED this . . . . A



A special cutter, in which the cutting portion is offset from taper shank, accurately machines all four sides of this rectangular hole—in one setting.

THE FELLOWS METHOD . . . MACHINES AND TOOLS FO

THE GEAR SHAPER METHOD

RECTANGULAR HOLE PROBLEM

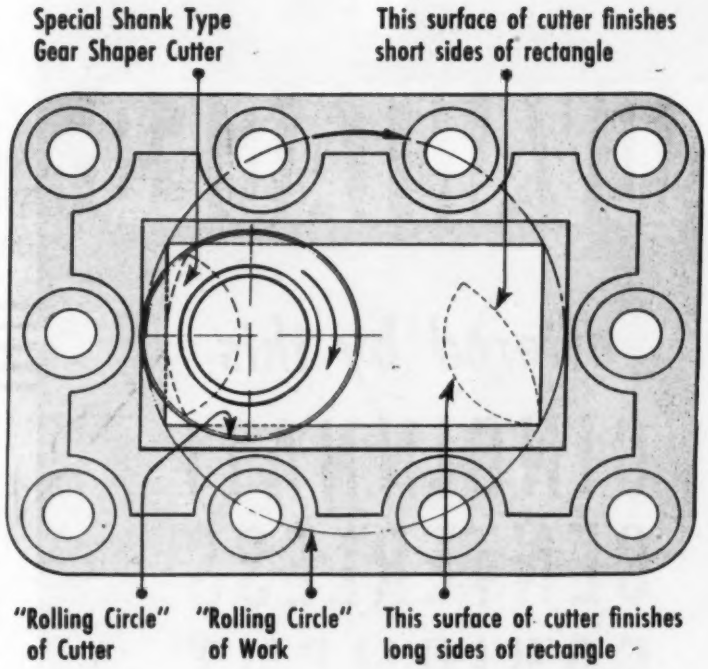
(1) The relatively thin walls of this bronze sand-casting . . . (2) the width of the surface to be machined, . . . and (3) the close tolerances demanded created a difficult machining problem . . . solved by the Fellows Method.

•

The diagram at the right shows a special Fellows Cutter which has been adapted to the machining of a *rectangular* hole. As far as the Fellows Method is concerned, this hole could have been square, triangular, oval—or of any other shape.

The work was done on a standard Gear Shaper, just released from a production assignment of gear cutting, and ready when this job is finished for other work—such as the cutting of gears, cams or irregular contours.

The VERSATILITY of the Gear Shaper commends it as a sound investment in any shop where high-precision production runs are the rule. Machines are available in capacities up to 100 inches. Write for our general catalog, "The Fellows Method" . . . The Fellows Gear Shaper Company, Springfield, Vermont—or 616 Fisher Building, Detroit 2, Michigan, or 640 West Town Office Building, Chicago 12, Illinois.



Fellows

FOR ALL OPERATIONS FROM BLANK TO FINISHED GEAR

4 ADVANTAGES

offered by this

CINCINNATI CENTERLESS EQUIPMENT

CINCINNATI

1 **BOTH DIAMETERS GROUND AT THE SAME TIME.** This is a two-wheel job—a 1″ and a 5″ face wheel are used.

2 **ACCURACY GREATLY IMPROVED.** Both diameters exactly in line—accurate to .0005″ on diameters; .0002″ for straightness.

3 **EASIER TO LOAD AND UNLOAD.** Part is loaded in fixture and then automatically lowered for grinding and raised for unloading.

4 **RAPID PRODUCTION.** Output averaged 155 crankshafts per hour.

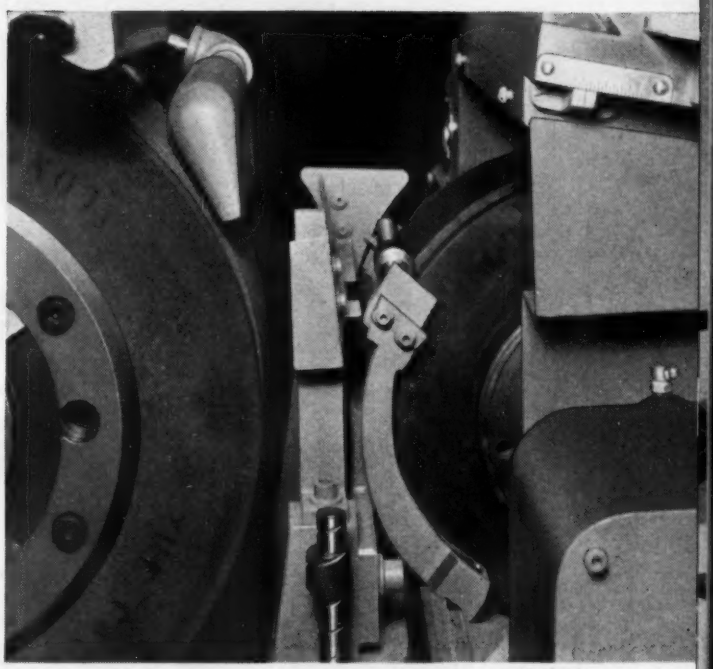
CINCINNATI No. 2 Centerless Grinding Machine. Catalog G-456-1 gives complete specifications. A copy of this book is yours for the asking. For a brief description of all CINCINNATI Grinders look in Sweet's Catalog File for Mechanical Industries.

Keep on buying WAR BONDS

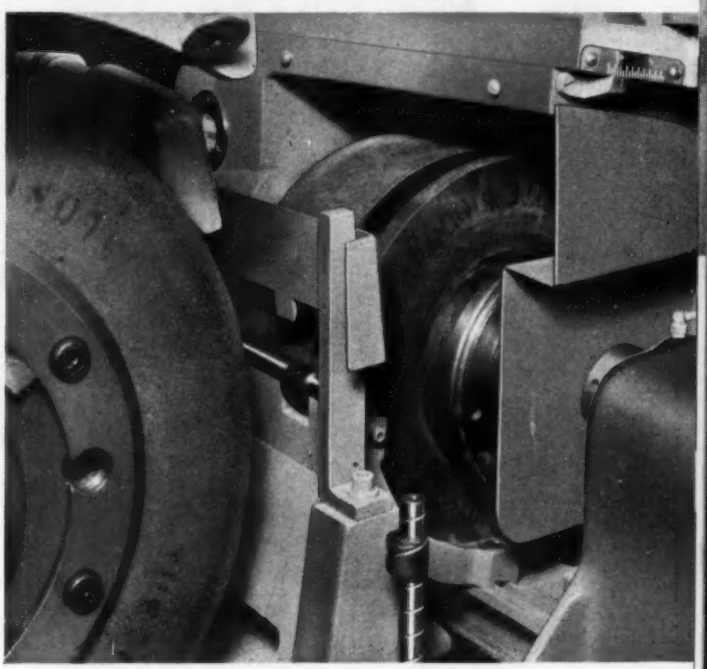
CINCINNATI

CENTER TYPE GRINDING MACHINES

The development of a special automatic work lift made it very advantageous to grind this crankshaft by the Centerless method. You will notice there are two lengths to be ground — one five inches long and the other one inch long. With this setup on a CINCINNATI No. 2 Centerless Grinder, both diameters are ground at the same time, resulting in greatly improved accuracy, reduced operator effort, and higher production. ¶ The illustration at the right (above) shows the automatic work lift in position for loading and removing the work. After the



part has been loaded into the lift, the action of the infeed lever automatically lowers it to grinding position as shown in the bottom photograph. When the grinding operation is completed, the lift automatically raises and the part is removed. The entire procedure requires only a few seconds. ¶ This setup is another example of CINCINNATI Centerless "know-how." It was developed by the engineers here at Grinding Headquarters and clearly demonstrates the advisability of submitting your grinding problems to them. They will be glad to discuss your Centerless or Centertype grinding requirements with you.



GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

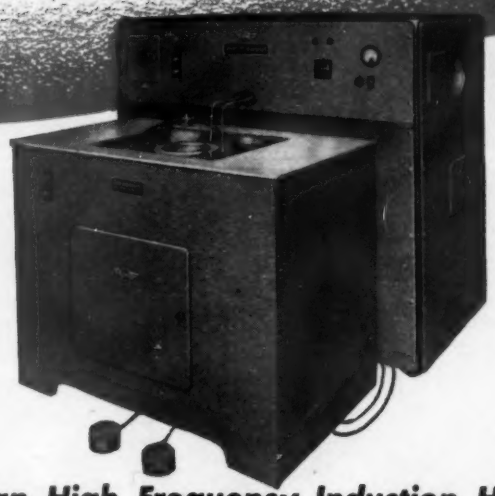
CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

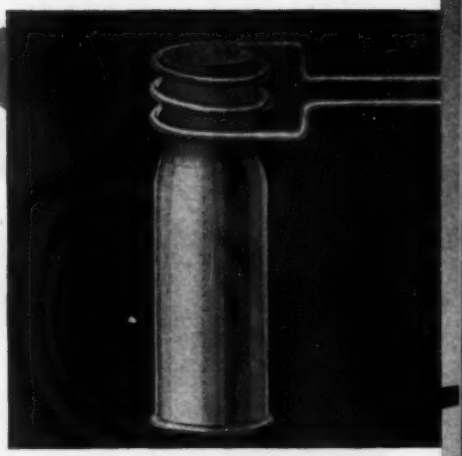
VAN NORMAN

"Packaged Heating"

A Van Norman Packaged Heating setup for surface hardening a gear section of a triple-cluster gear. The gear teeth are hardened to 55-57 Rockwell C in 20 seconds which includes 13 seconds heating and 7 seconds for quenching. Depth of heat penetration is .035" to .045". The teeth of the small gear section as well as the larger middle gear section are also hardened to 55-57 Rockwell C. Small gear is hardened in 16 seconds — 10 seconds for heating and 6 seconds for quenching. The large gear is hardened in 25 seconds — 17 seconds for heat followed by an 8-second quench.

"It pays to





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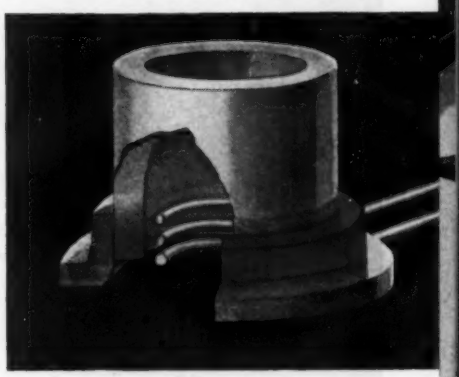
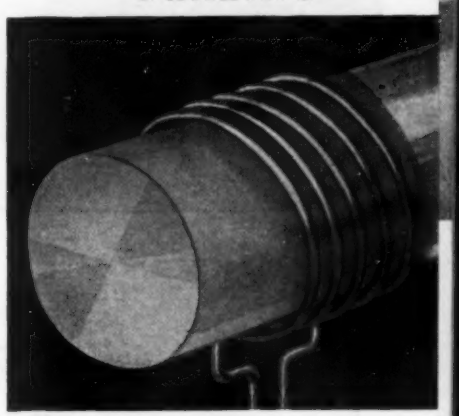
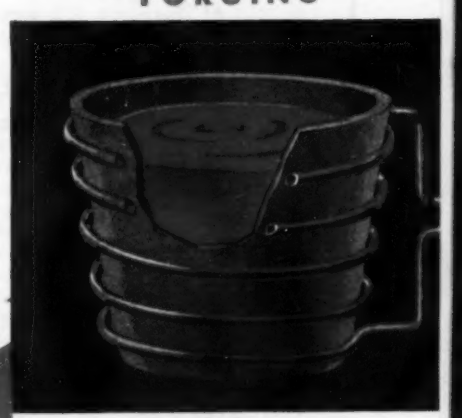


BRAZING



FORGING



MELTING

Van Norman High Frequency Induction Heating Provides a most effective and economical method for Hardening, Brazing, Soldering, Annealing, Forging, Melting . . . All with ONE Unit!

The Van Norman High Frequency Induction Heating Unit gives manufacturers and job shops a *complete, ready-to-use "Power Package"* that fills practically all average heating requirements for hardening, brazing, annealing, forging, etc. And best of all, the Van Norman "Power Package" does all these jobs in seconds or minutes as compared to hours required by previous processes. Because the heat penetration is quick and uniform, there is better uniformity in the finished product since scale and warpage are eliminated in practically all heating applications.

Changing from one job to another, such as hardening to hardening or, from hardening to brazing is quickly accomplished, too. All that the operator has to do is select the proper heating coil and workholding fixture for a job . . . set the proper time cycle . . . tune the machine — all these operations take but a few minutes — and he's ready to perform the work.

Add up the savings in time, the economy of operation, the ease and speed of changing from one job to another, and the wide range of work that can be done and you'll find the Van Norman "Power Package" pays for itself out of savings in very short time.

Investigate Van Norman High Frequency Induction Heating. Find out what it can do for you. Write for catalog and details.

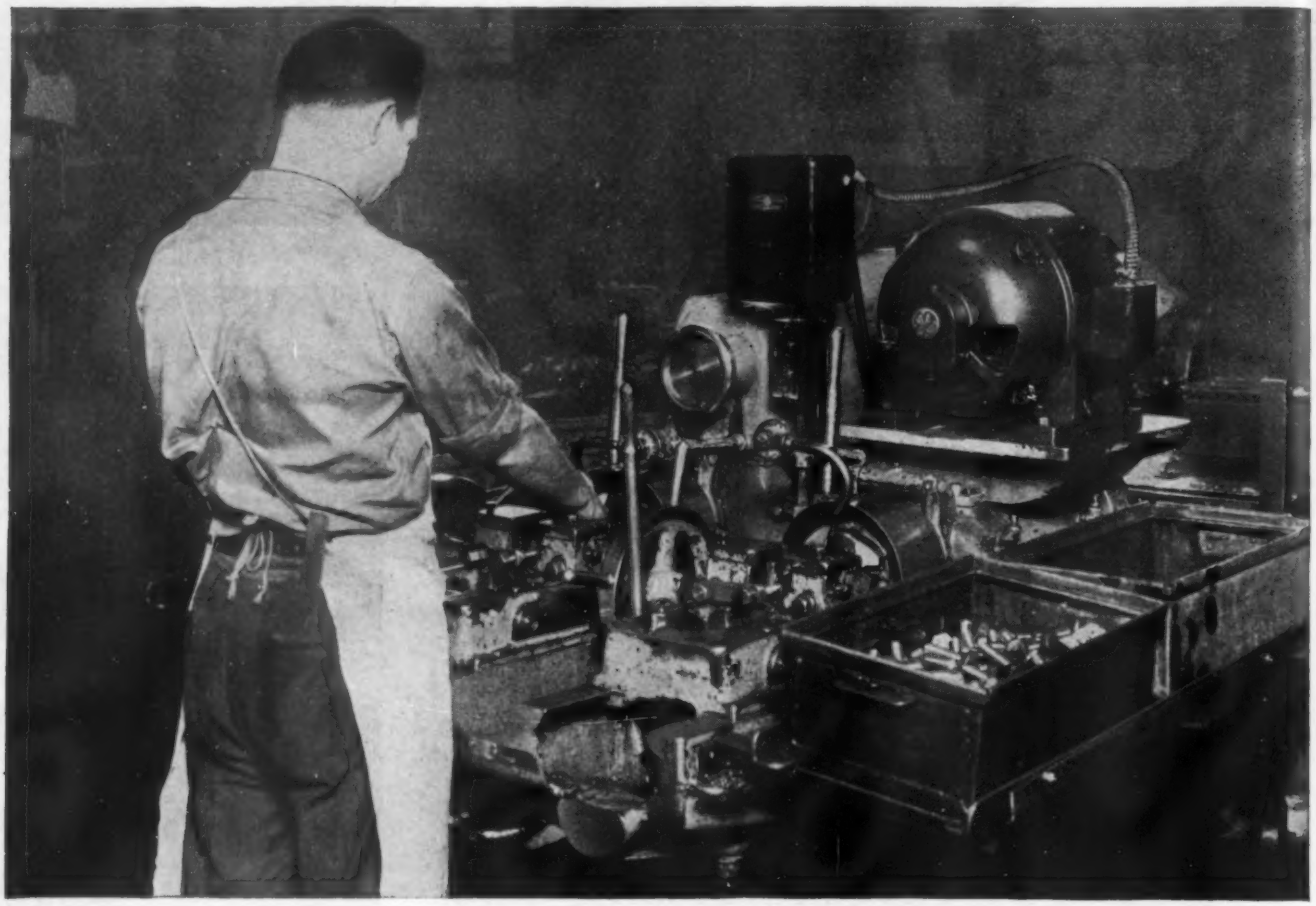
VAN NORMAN COMPANY

ELECTRONICS DIVISION

SPRINGFIELD 7, MASSACHUSETTS

Van Normanize

LANDIS STANDARD THREADING MACHINES ASSURE HIGH PRODUCTION—LOW THREADING COST



The modern design and sturdy construction of the Landis Standard Threading Machine assures the rigidity required for the production of threads of the finest quality. The 7/8" Threading Machine illustrated—equipped with the Lanco Hardened and Ground Head is threading hex head, ground body bolts. These bolts, made from special alloy, heat treated steel, are 3/4" diameter and have 1" thread length. An average of 250 bolts are threaded per hour to Class 3 specifications. Two hundred to two hundred and fifty bolts are threaded per grind of the chasers. Threading cost is reduced to a minimum.

The LANDIS LINE

THREAD CUTTING MACHINES
- Landmaco Threading Machines
- Bolt Factory Threaders
- Automatic Forming and Threading Machines
- 4 Spindle Semi-Automatic Threading Machines
- Pipe and Nipple Threading Machines

THREAD CUTTING DIE HEADS
- Landmatic (for Turret Lathes and Screw Machines)
- Landex (for Automatic Screw Machines)
- Lanco (for Automatic, Semi-Automatic and Hand-Operated Threading Machines)
- Lanco Pipe and Nipple Threading Heads
- Stationary Pipe Die Heads
- Reverse Taper Die Heads
- Standard Rotary Die Heads

PRECISION THREAD GRINDERS

PIPE THREADING AND CUTTING MACHINES

ROLLER PIPE CUTTERS

CHASER GRINDERS

COLLAPSIBLE AND ADJUSTABLE TAPS

Write for the Booklet
"BE THREADWISE"

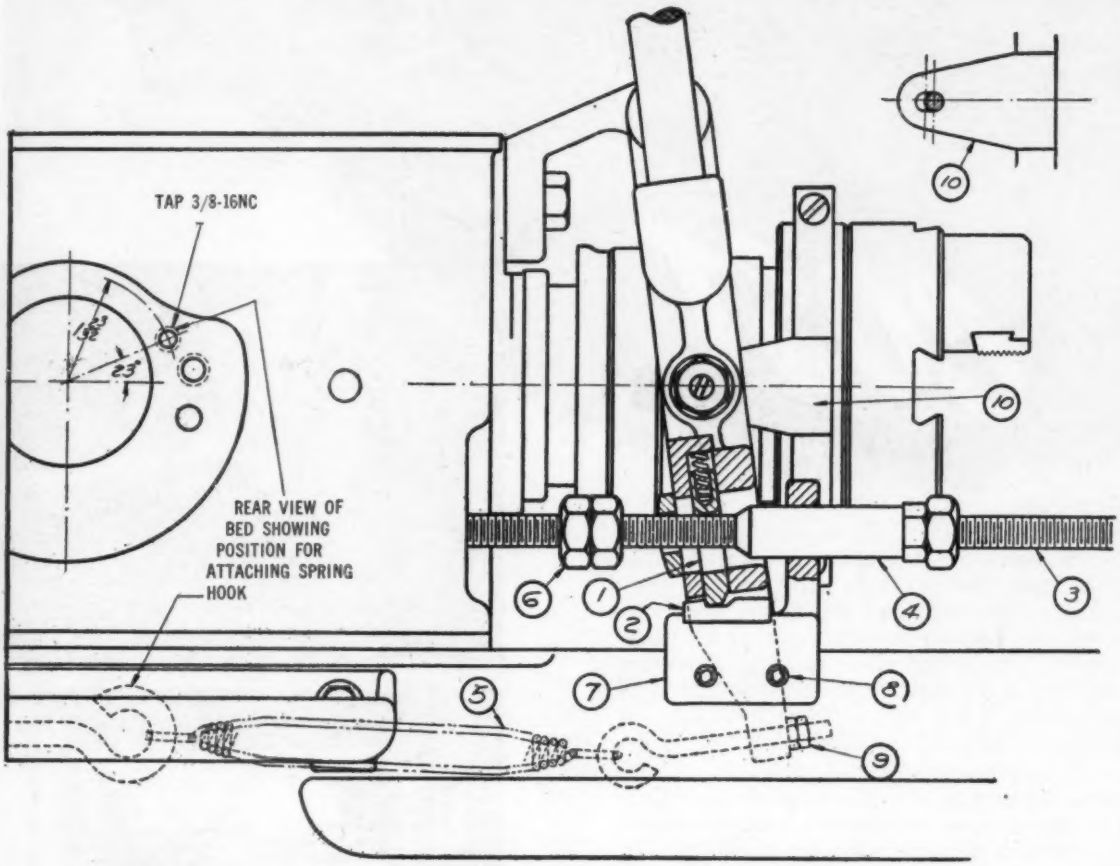
LANDIS REG. U.S. PAT. OFF. TRADE MARK

THREAD TIPS

A Good Mechanic Knows and Cares For His Machine

In the Interest of Efficiency, Better Workmanship and Higher Production

UICK OPENING MECHANISM FOR LANDIS 7/8" THREADING MACHINE



s attachment is designed to effect an instantaneous opening of the die head instead of the gradual opening move-nt which is obtained with the standard machine.

ing the threading operation, the yoke is held in its closed position by a latch (1) and latch block (2). In this position yoke pivot screw does not touch either end of the slot in the yoke ring (10). This permits the die head to lock in usual manner inside the head instead of by means of the latch (1) and latch block (2). The forward travel of the iage and yoke trip rod (3) forces the latch operating sleeve (4) to raise the latch (1) away from the latch block (2). s released, the yoke is quickly pulled to the open position by the action of the extension spring (5). The yoke is ed during the return travel of the carriage by the trip rod nuts (6).

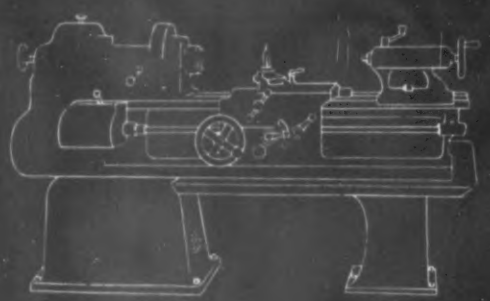
set for the desired thread length, move the latch operating sleeve (4) forward or back on the yoke trip rod (3). en changing the diameter to be threaded, it is necessary to adjust the latch bracket (7) along the ways of the chine by loosening the screws (8). Also, the tension of the spring (5) must be adjusted by means of the nuts (9).

This mechanism can be attached to machines in service.

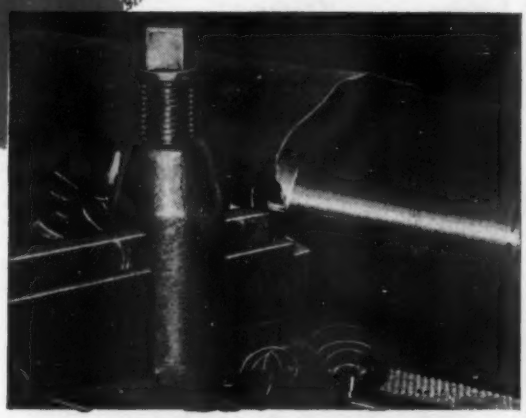
LANDIS MACHINE COMPANY

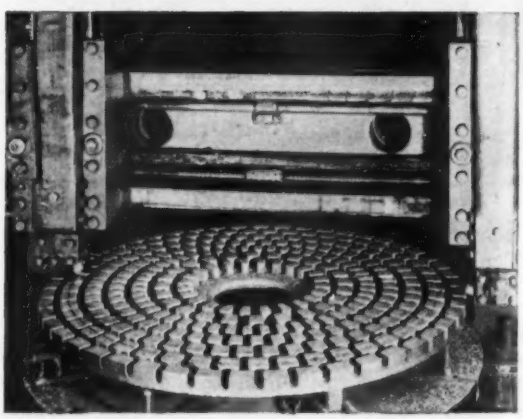
WAYNESBORO · PENNA · U·S·A·

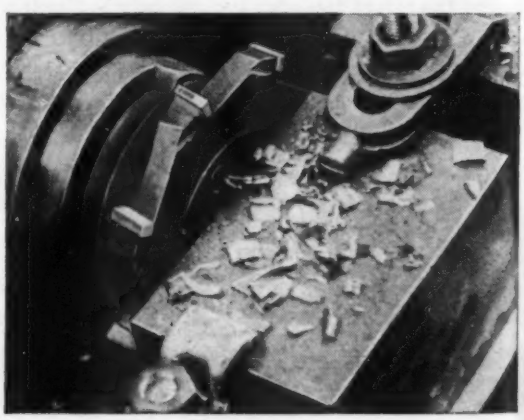
The most important thing a KENNAMETAL TOOL *Cuts*



it . . . COST







Cost—in the over-all terms of man-hours, materials, and machines invested—is the most important factor in either wartime or peacetime production. War goods produced economically help save the lives of our fighting men, hasten the successful conclusion of hostilities, counteract inflation, will ease the transition from war to peace. Peacetime goods produced economically help more people enjoy the benefits of better things at less cost.

Are you effecting machining economies? If you use Kennametal-tipped tools, the answer is—***Yes***. Kennametal is the unique cemented carbide composition—discovered, developed, and produced in America. Kennametal-tipped tools cut and mill metals 2 to 6 times faster—remove 10 to 50 times the metal before the tool must be resharpened—last up to 20 times as long as former tools—produce a smooth, accurate finish that reduces grinding and polishing operations—in many cases eliminate expensive and time-consuming annealing operations by machining steel in the hardened state. Their use multiplies the capacity of available equipment—means utmost productivity per man, per machine, per unit of power consumed.

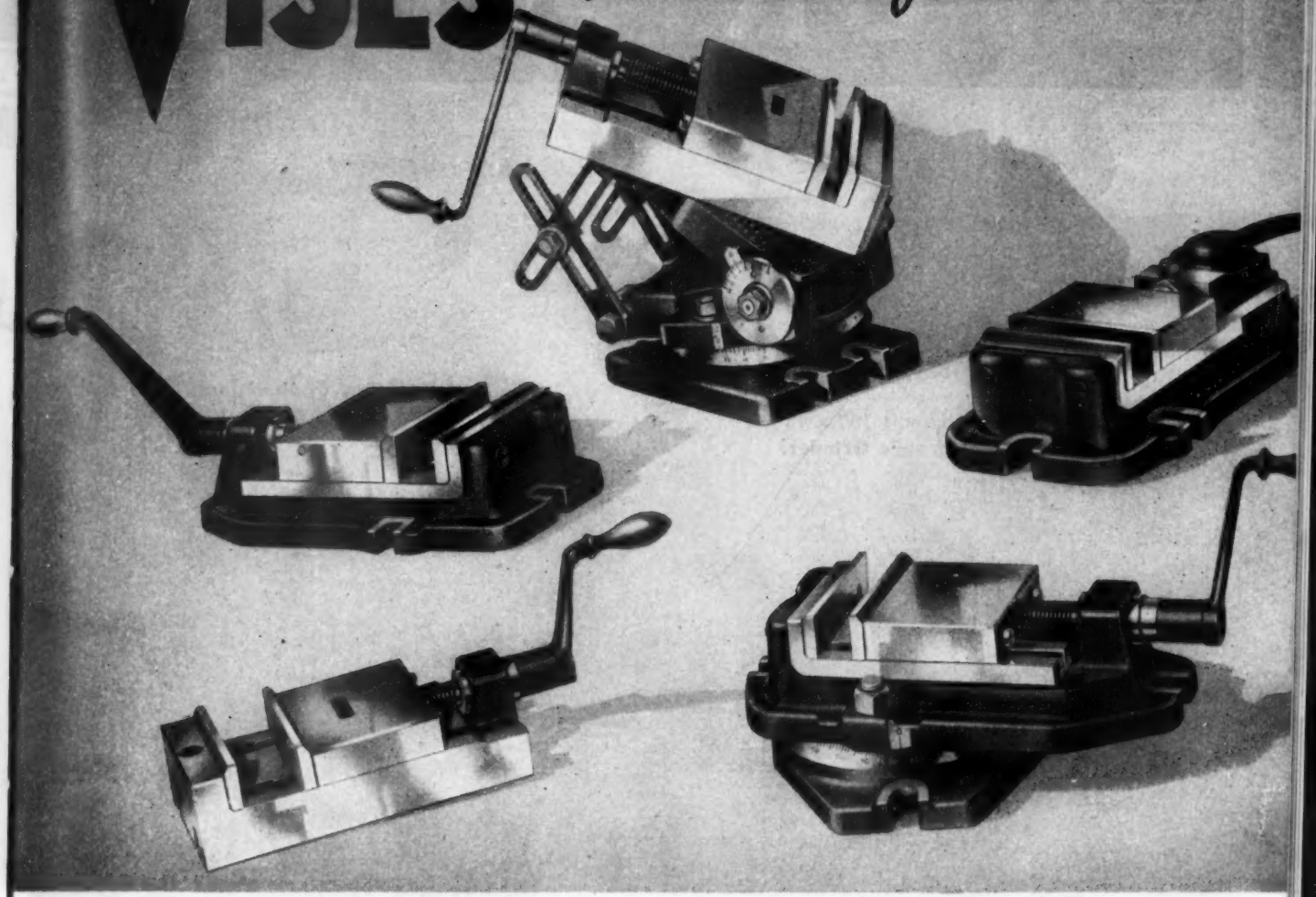
Kennametal-tipped tools are available for lathe, boring mill, and milling machine operations on steels up to 550 Brinell, cast-iron, and non-ferrous materials. Switch to Kennametal today to cut metals—and most important, to cut costs.

KENNAMETAL

SUPERIOR CEMENTED CARBIDES

KENNAMETAL *Inc.*, 103 LLOYD AVE., LATROBE, PA.

VISES — *Available from Stock!*



STRONG — ACCURATE — DURABLE

Brown & Sharpe Vises are made as low as possible to hold work close to the machine table.

A bearing the full width of the vise jaws gives solid support to withstand pressure of the cut . . . even at the extreme ends of the jaws.

The heavy screws are of a form and lead chosen particularly for the requirements of each type of vise.

The complete line of Brown & Sharpe Vises includes styles for practically every machine shop requirement. Circular showing complete listing sent upon request. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

PLAIN
FLANGED
SWIVEL
CAM
ADJUSTABLE
ADJUSTABLE SWIVEL
TOOLMAKERS' UNIVERSAL

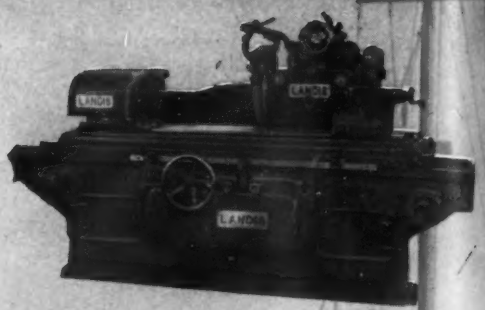
B·S

. . . We urge buying through the Distributor

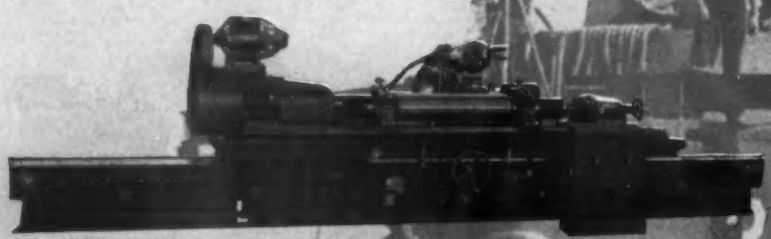
BROWN & SHARPE

FOR WAR —

Front view of the Landis 10" x 48" Type CH Plain Hydraulic Grinder.



Front view of the Landis 14" x 36" Type C Hydraulic Universal Grinder.



Front view of the Landis 20" x 120" Type B Hydraulic Roll Grinder.

Front view of the Landis No. 2 RACE-A-WAY Grinder.

While the men in the allied armed forces have been constantly gaining strength the Landis Tool Company has been putting forth every effort to sustain its high production of precision grinders for war industry. Plain Grinders, Universal Grinders, Crank Pin Grinders, Cam Grinders, Ball Race Grinders, Roll Grinders and Valve Grinders are constantly going forward from our plant to take their place in the battle of production.

War industry requires performance of machine tools the like of which has never been demanded before. Machines engaged in the battle of production must maintain accuracy and output. They, like the armed forces, must be able to "take it." Landis Grinders have shown that they are capable of grinding to close tolerances, maintaining a high rate of production and doing this 24 hours a day, 7 days a week, 52 weeks a year.

IT'S LANDIS

LANDIS TOOL

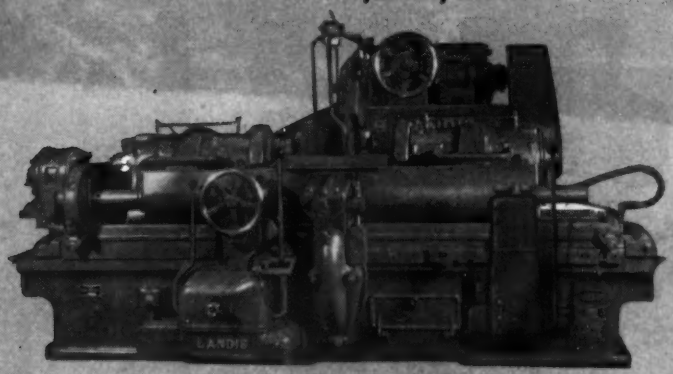
OR PEACE

The mass production methods now playing such a great part in our war effort were developed by peacetime consumer industries. Landis Grinders were developed to their present productive capacity in order to meet the demands of these industries. When peace returns there will scarcely be a metal working plant, regardless of size or product, which cannot use at least a portion of the grinding equipment manufactured by Landis.

Among the Landis grinders are found the following types: Plain Grinders, Universal Grinders, Crank Pin Grinders, Cam Grinders, Piston Grinders, Valve Grinders, Crankshaft Regrinders, Ball Race Grinders, Chucking Grinders, Roll Grinders, and Radial Crank Grinders.

Please do not hesitate to write for any information you may desire. 414

Front view of the Landis 18" Radial Cam Grinder.



Front view of the Landis 16" x 32" Type D Hydraulic Crank Pin Grinder.

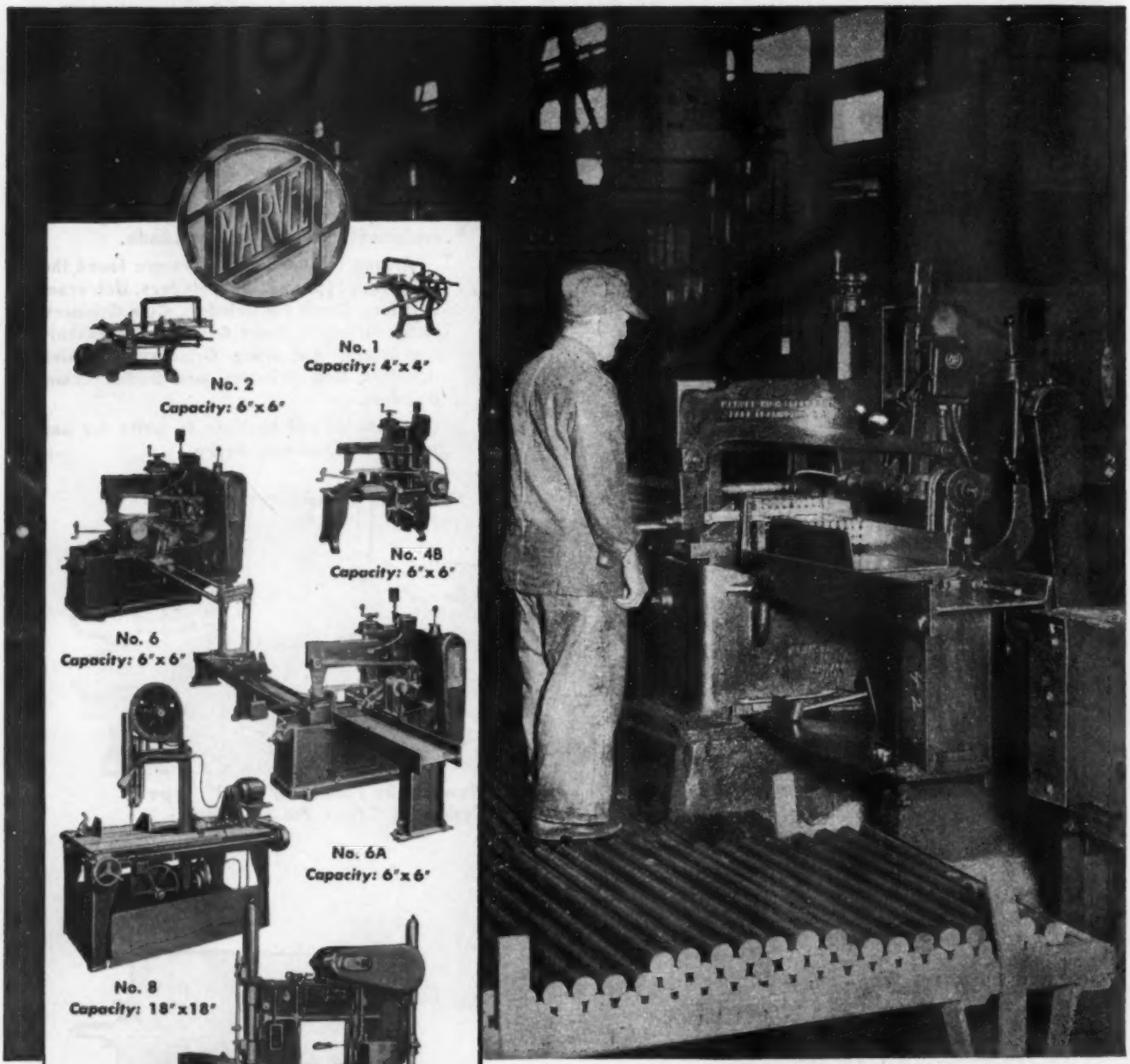
Front view of the Landis 5" x 40" Type D Hydraulic Cam Grinder.

Front view of the Landis 4" x 12" Type H Plain Hydraulic Grinder.

FOR PRODUCTION

PRECISION LANDIS GRINDERS

COMPANY WAYNESBORO, PA.



This MARVEL 9A Production Saw paid its cost in 30 days

There's none of the old fashioned, tedious, plugging-along type of hack sawing at the Shop of the I. C. Railway because they do their cutting-off with a high speed MARVEL No. 9A Production Saw—the same MARVEL Saw used to cut-off astronomical numbers of rifle and machine gun barrels.

Built for continuous heavy-duty operation, this really fast, all-ball-bearing saw automatically feeds, measures and cuts-off single or nested bars with no more operator attention than an automatic screw machine. On the job illustrated above, six hours after forty 18' x 1" steel bars were laid on the saw's feed rack, they had been cut into 840 accurate, 10-inch lengths, for staybolts. Equally efficient on both production runs and miscellaneous cuts, this saw "paid for itself in the first thirty days of operation".

Write for new Catalog

ARMSTRONG - BLUM MFG. CO.

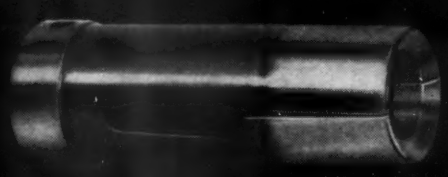
5700 Bloomingdale Avenue — Chicago 39, U.S.A.

Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

HARDINGE

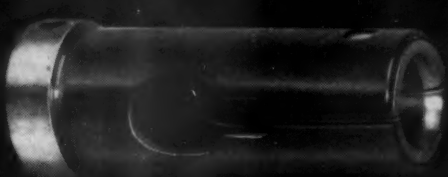
Your dependable source of supply for engineered collets, feed fingers and pads for all models of automatics, chucking machines and turret lathes. . .any type or size. . .any model, old or new.

HARDINGE BROTHERS, INC. . . . . ELMIRA, N. Y.

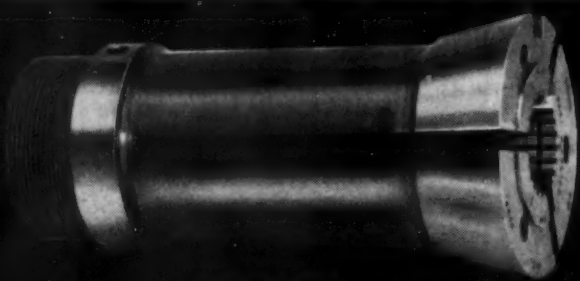


HARDINGE
SOLID FEED FINGER

HARDINGE
SOLID COLLET

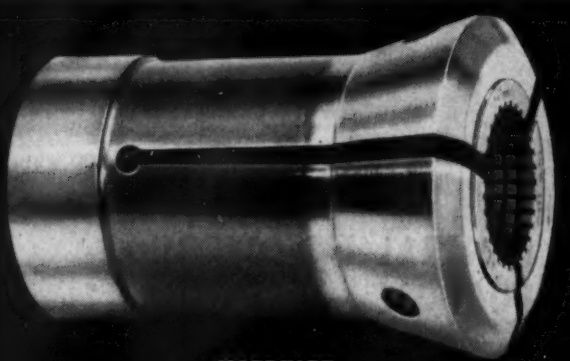


HARDINGE
STYLE "B" MASTER FEED FINGER AND PADS



HARDINGE STYLE "S"
SURE-GRIP MASTER COLLET AND PADS

HARDINGE
CONVENTIONAL MASTER FEED FINGER
AND PADS



HARDINGE
CONVENTIONAL MASTER COLLET AND PADS

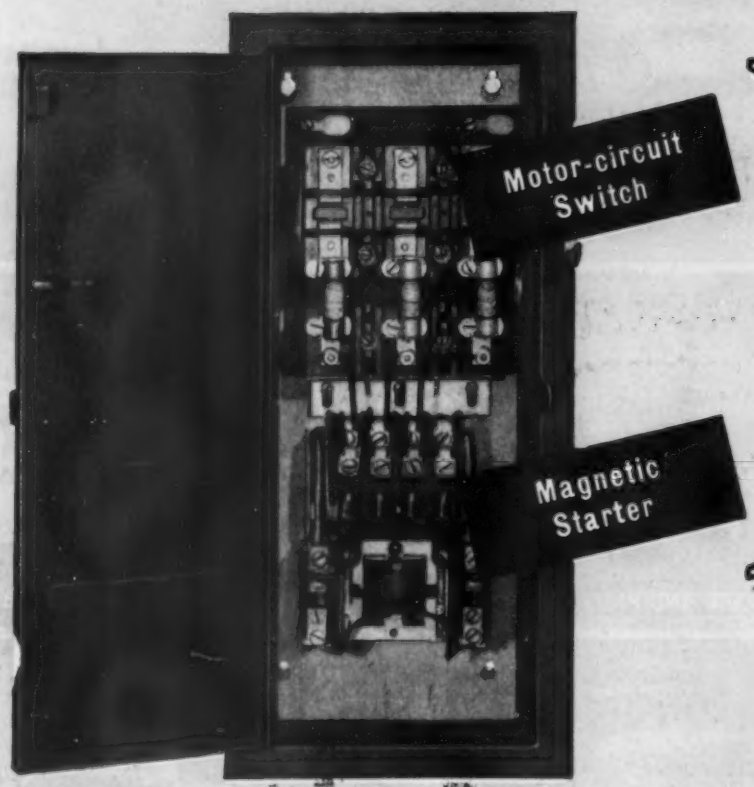
ADJUSTABLE TENSION FEED FINGER

For use with No. 00 and No. 0 Brown & Sharpe machines. Provides exact desired tension at all times for varying needs and compensation for wear.

ENGINEERED RECTANGULAR SERRATIONS INSURE PROPER GRIP AT ALL TIMES . . .
A PROVEN HARDINGE ACHIEVEMENT.

Hardinge rectangular serrations provide a definite support against cross slide thrusts and turret or end working tool thrusts. The 90° top surface and the 90° shape on the sides continually assure the same proper contact with bar stock.

EVERYTHING YOU NEED to



110 to 600 Volts

COMBINATION STARTER

Why two devices? ONE can do the job.

GENERAL PURPOSE

Type 1 enclosure for indoor applications where atmospheric conditions are normal. Available up to and including NEMA Size 5.

CORROSION-RESISTANT

Two forms are available —Type 3 for corrosive atmospheres; Type 8 for hazardous locations. All arcing parts and terminals of Type 8 forms are at least six inches under oil.

DUST-TIGHT

Type 5 enclosure for use in steel mills, cement mills, and other locations where the dust content of the atmosphere is so high as to make a dust-tight case desirable.

FOR HAZARDOUS LOCATIONS

Type 7 case for Class I, Group D, locations is made of cast, high-strength alloy. Designed to withstand internal explosions.

WATER-TIGHT

Type 4 case is suitable for outdoor use, and for damp places indoors, such as dairies, breweries, and piers.

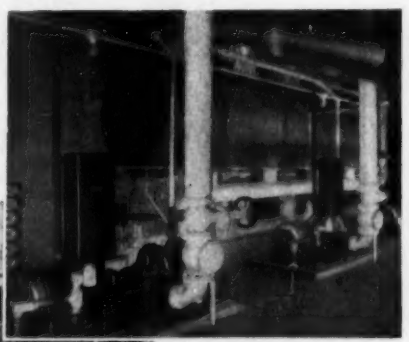
control and protect your motor in ONE COMPACT CONTROL UNIT

COMPLETE full-voltage control of squirrel-cage motors or the primary control of wound-rotor motors—with extra safety, very low installation cost, good appearance, and other advantages.

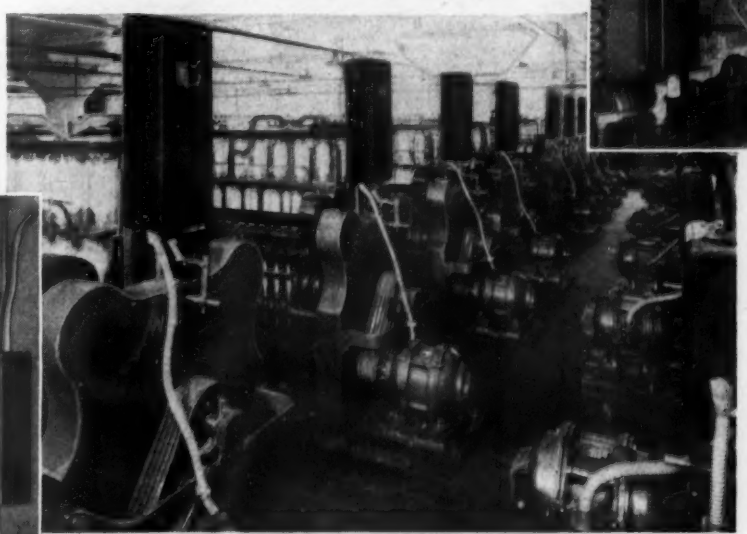
Which Type Do You Need?
If you want short-circuit protection, you can select a starter which has a fusible motor-circuit switch or a breaker to provide such protection. Or, if you do not need short-circuit protection, you can choose a starter which is equipped with a nonfusible motor-circuit switch that serves only as a disconnect. Both types are available in a variety of enclosing cases, as shown on the opposite page.

Co-ordinated for Protection
With G-E combination starters, you're sure that the motor-circuit switch or breaker has the proper rating for the magnetic starter with which it is used. The fuses or breakers provide adequate short-circuit protection to the motor, the starter, and subsequent motor-branch-circuit conductors when connected to a power supply for which they are recommended. The co-ordination of thermal overload relays with the fuses or breakers affords complete motor overcurrent protection under any condition of operation.

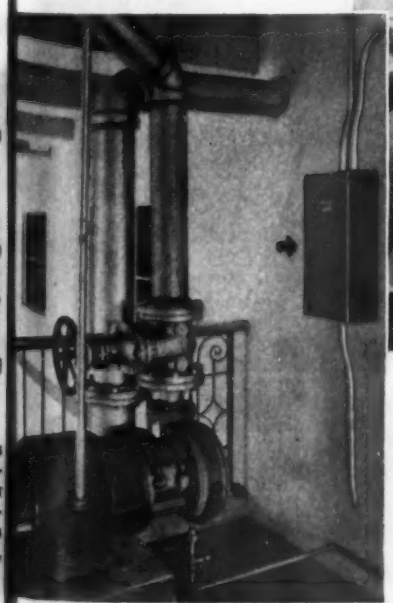
Increased Safety
By placing the motor-circuit switch in the same case with the magnetic starter, the switch can be mechanically interlocked with the cover, so that the cover cannot be opened while there is power on the starter. This is an important advantage because, when a separately mounted switch and starter are used, there is nothing to prevent the operator from opening the case while the starter is "hot."



G-E combination starters can be mounted on or near the machine even in damp locations, such as this pump-room installation.



This combination starter controls a ball-bearing splash-proof motor direct-connected to a centrifugal mash pump in a brewing plant.



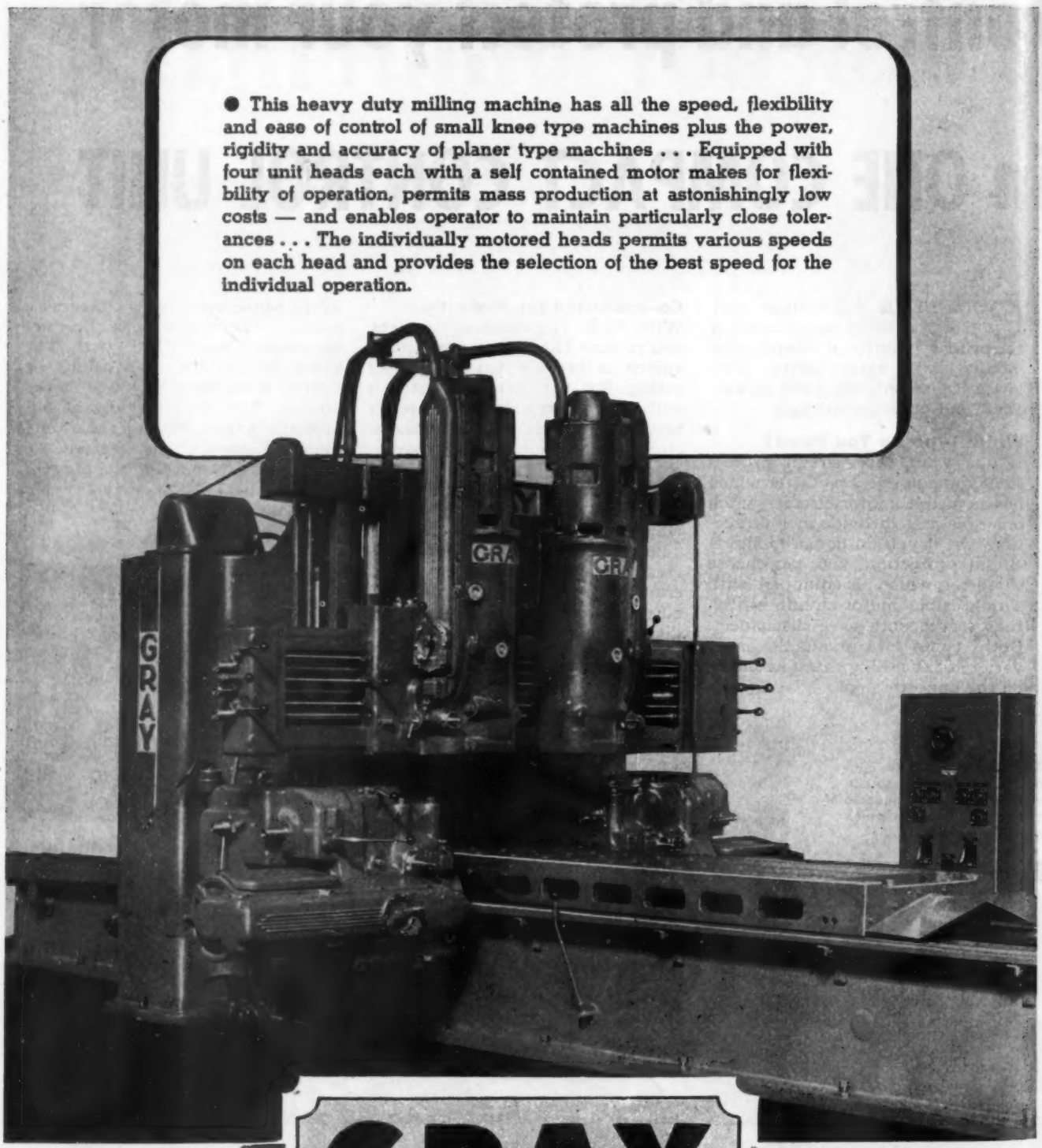
Combination starters and shipper-rod switches are used to control the operation of each frame operated by this spinning-frame drive.

WANT MORE DATA? More complete information on G-E combination starters will be found in Bulletin GEA-3715. Ask our nearest office for a copy or write direct to General Electric Company, Schenectady 5, N. Y.

Every week 192,000 G-E employees purchase more than a million dollars' worth of War Bonds

GENERAL ELECTRIC

Gray Milling Machine



● This heavy duty milling machine has all the speed, flexibility and ease of control of small knee type machines plus the power, rigidity and accuracy of planer type machines . . . Equipped with four unit heads each with a self contained motor makes for flexibility of operation, permits mass production at astonishingly low costs — and enables operator to maintain particularly close tolerances . . . The individually motored heads permits various speeds on each head and provides the selection of the best speed for the individual operation.

GRAY

THE G. A. COMPANY
Cincinnati 7 Ohio, U. S. A.

THE GRAY LINE — Double Housing and Openside Planers, Switch Planers, Die Block Planers, Double-Housing and Openside Milling Planers, Planer Type Milling Machines, Horizontal Boring Machines.

A 12" 8-spindle Type "D" Mult - Au - Matic machining blade gears in a plant of a famous midwestern maker of airplane propellers.

Accent on Accuracy

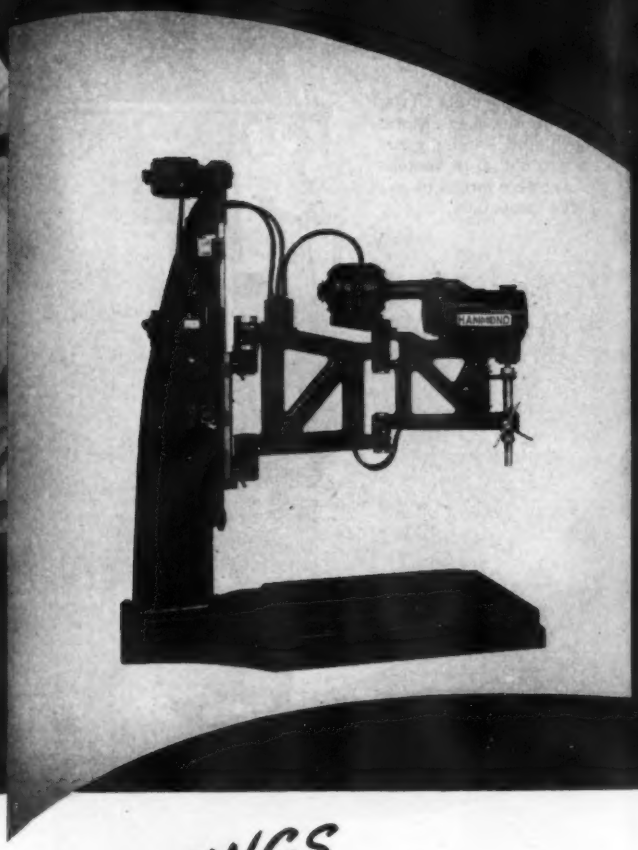
When you think of the many Mult-Au-Matics now busy in the war plants of the nation, you probably think first of the increased output they effect, by drastically lowering machining time per part.

True, the Mult-Au-Matic method, machining six or eight parts simultaneously, does result in vastly greater output. But it is well to remember too, that Mult-Au-Matics turn out work that stands up to aviation's rigid standards of accuracy — or you would not find them in these plants, no matter how superior their increased output.

Consider MULT - AU - MATIC maintained Accuracy on all work, even in the face of inexperienced operators due to the present manpower shortage.

THE BULLARD COMPANY BRIDGEPORT 2 CONNECTICUT

FASTER DRILLING and TAPPING of Miscellaneous Holes



• For drilling or tapping miscellaneous holes over a large layout the Hammond Radial is an ideal choice. With its unique bracket type construction the spindle can be swung quickly from hole to hole without any intermediate adjustment. Six quick speed changes are instantly available and the Hammond tapping reverse is very fast and convenient to operate when there are a wide variety of sizes and depths of tapped holes. Write, wire or phone for prices and delivery information.

THE FOOTE-BURT COMPANY • CLEVELAND 8, OHIO

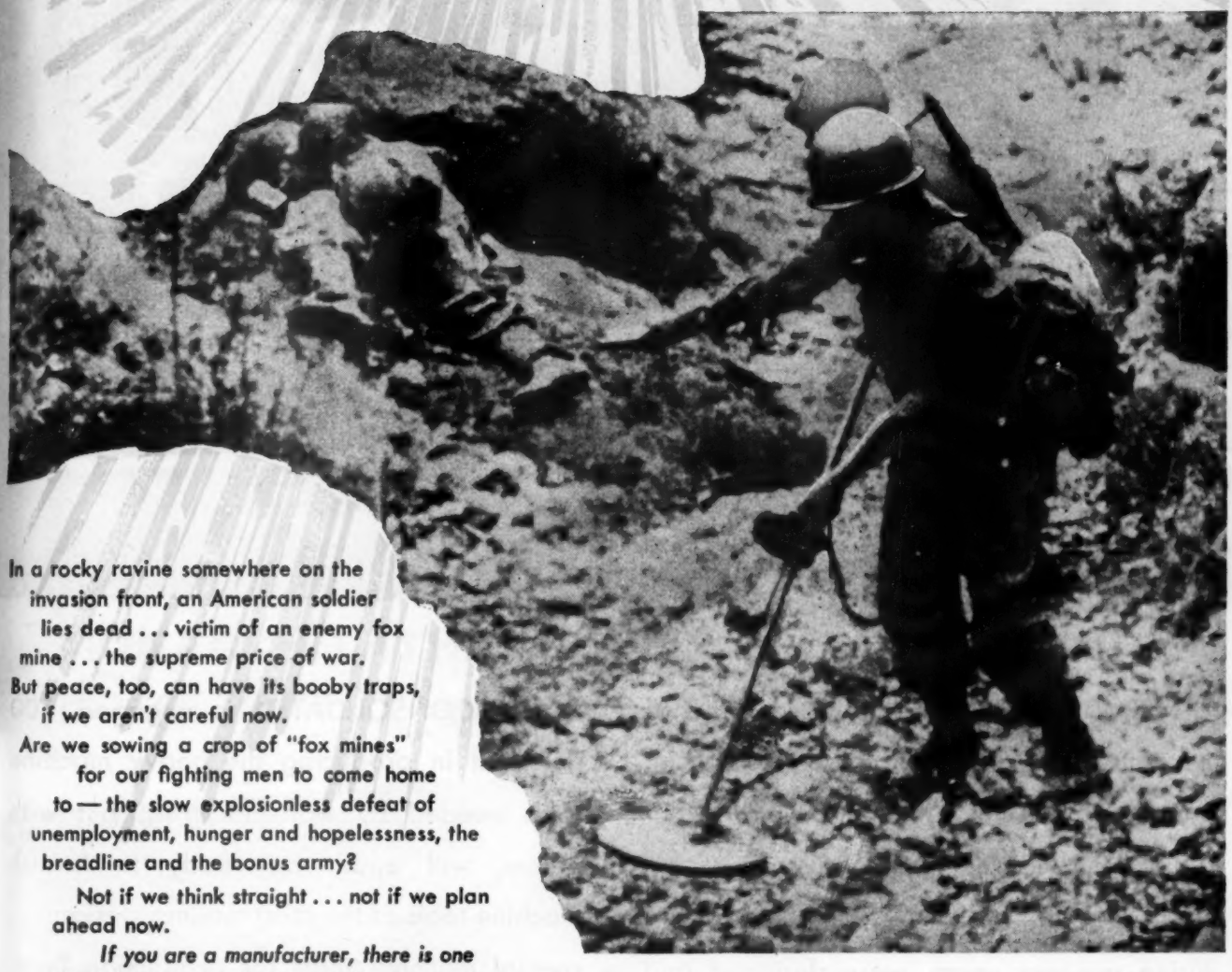
SWINGS TO ANY POSITION

MOVE UP THE SCHEDULE ☆ WIN THE WAR QUICKER

FOOTBURT-HAMMOND
Radial Drilling Machines

Are we sowing a crop of peacetime

FOX MINES IN AMERICA?



In a rocky ravine somewhere on the invasion front, an American soldier lies dead . . . victim of an enemy fox mine . . . the supreme price of war.

But peace, too, can have its booby traps, if we aren't careful now.

Are we sowing a crop of "fox mines" for our fighting men to come home to — the slow explosionless defeat of unemployment, hunger and hopelessness, the breadline and the bonus army?

Not if we think straight . . . not if we plan ahead now.

If you are a manufacturer, there is one thing that you can do at once: Have your production men and planners consult now with the engineers of the basic machine tool producers. They can help you in planning ahead for the difficult task of reconverting your own skills and machinery to an all-out peacetime production.

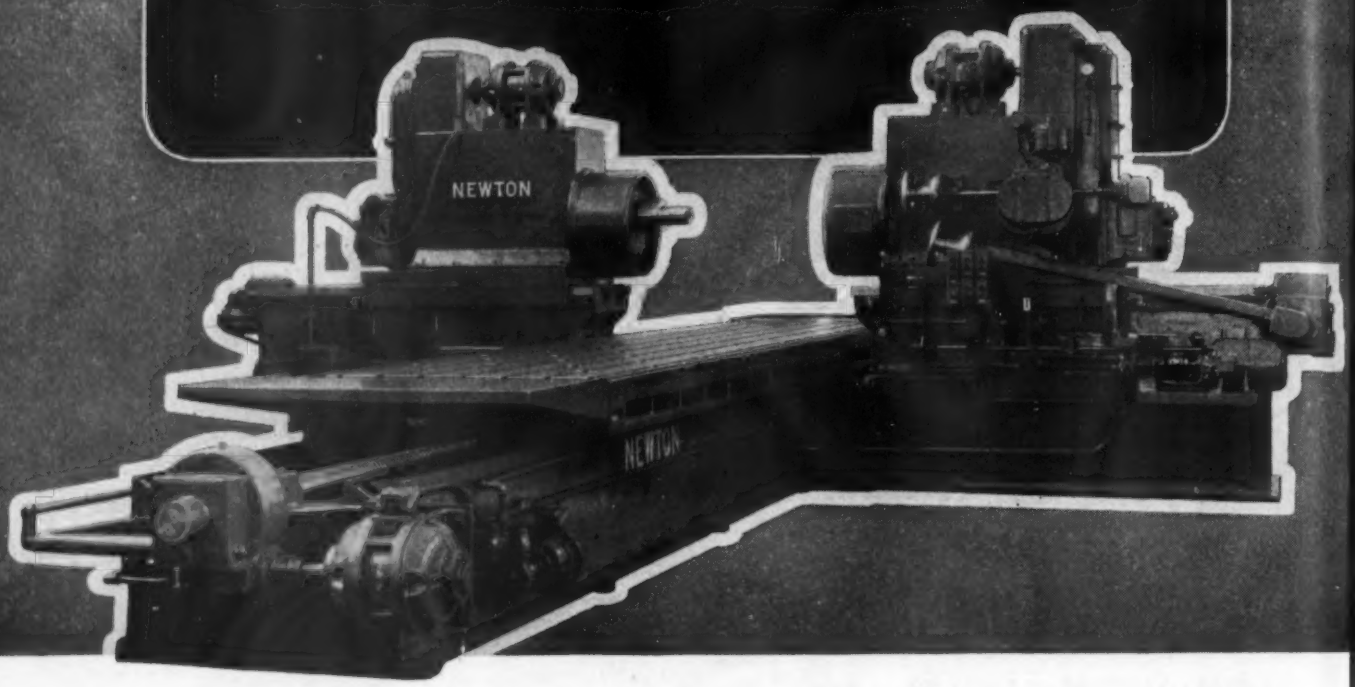
One of these engineers is a Bryant man. We urge you to call him today. For his specialized knowledge of internal grinding machinery is important to the manufacture of literally *everything* that will make this country a finer place: this is victory, a victory that it will be safe for our boys to come home to.

BRYANT CHUCKING GRINDER COMPANY SPRINGFIELD VERMONT, U.S.A.

NEWTON

DUPLEX HORIZONTAL BORING MACHINE

for handling several boring and facing operations without changing set-up



This NEWTON machine is representative of the many and diversified types of *Special* machine tools built by CONSOLIDATED.

Many of the special machines, used in the production lines of the automotive industry during pre-war years, were designed and built by CONSOLIDATED.

Today, CONSOLIDATED is engaged 100 per cent in producing the heavy machine tools needed by war industries, but with peace, will again be ready to furnish machine tools of the most modern design . . . *special* machine tools for production lines, or to suit any individual requirements.

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

CONSOLIDATED
MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

Faster Production OF MOLDS AND DIES

on the MONARCH SHAPEMASTER

You can turn one or any quantity of mechanically perfect molds, dies, punches or similar shapes on a MONARCH SHAPEMASTER from four to five times faster than by other methods.

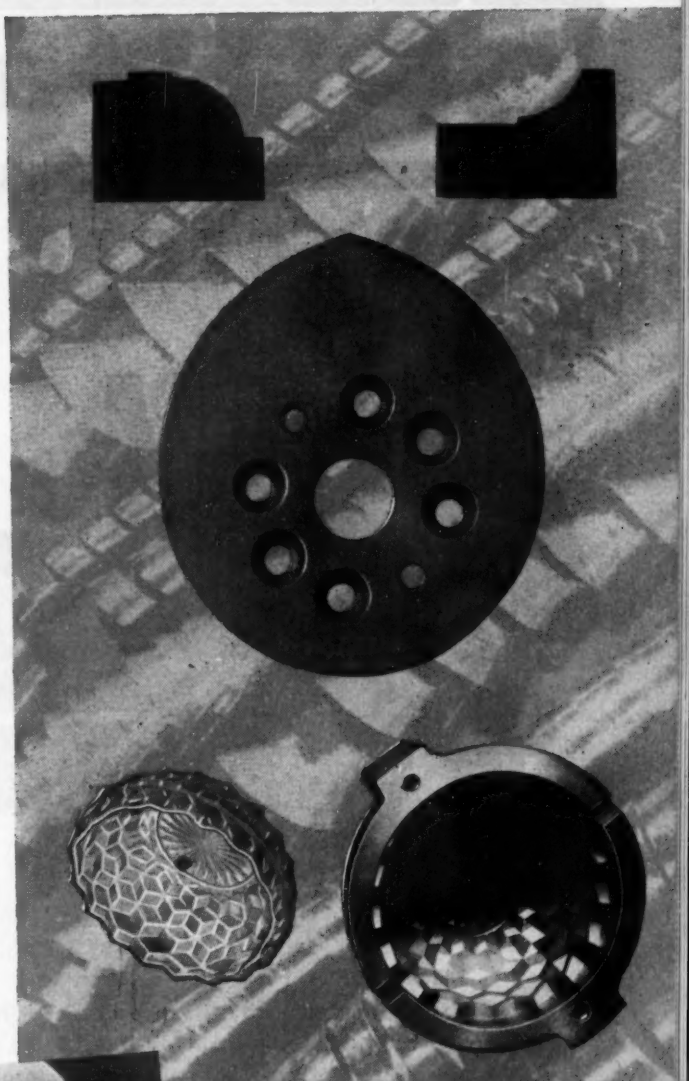
One master cam will reproduce literally thousands of different round, oval or other shapes on the outside, inside or face of the work. With Monarch-Keller electric controls and a thin metal template you can turn the most intricate contours with precision and speed.

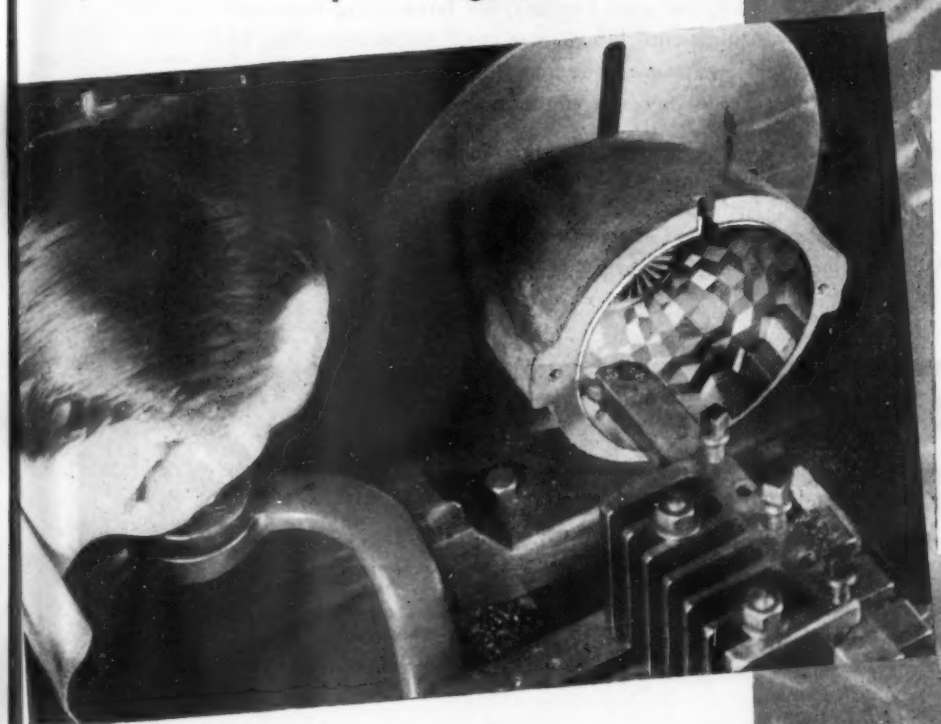
We cannot equip your present lathes with Monarch-Kelly attachments, because they must be built in at the factory. However, we can demonstrate on actual work the value of this equipment . . . and we'll gladly study test samples or blueprints to determine the utility of MONARCH SHAPEMASTERS for your tough jobs. We can make fairly prompt deliveries for War production. An inquiry to Sidney, Ohio, or to one of our convenient field offices will bring fast action.

THE MONARCH MACHINE TOOL COMPANY • SIDNEY, OHIO

Direct factory branches at Chicago • Cleveland • Detroit
Newark • Pittsburgh • Representatives in principal cities.

MONARCH LATHES *Save Time*



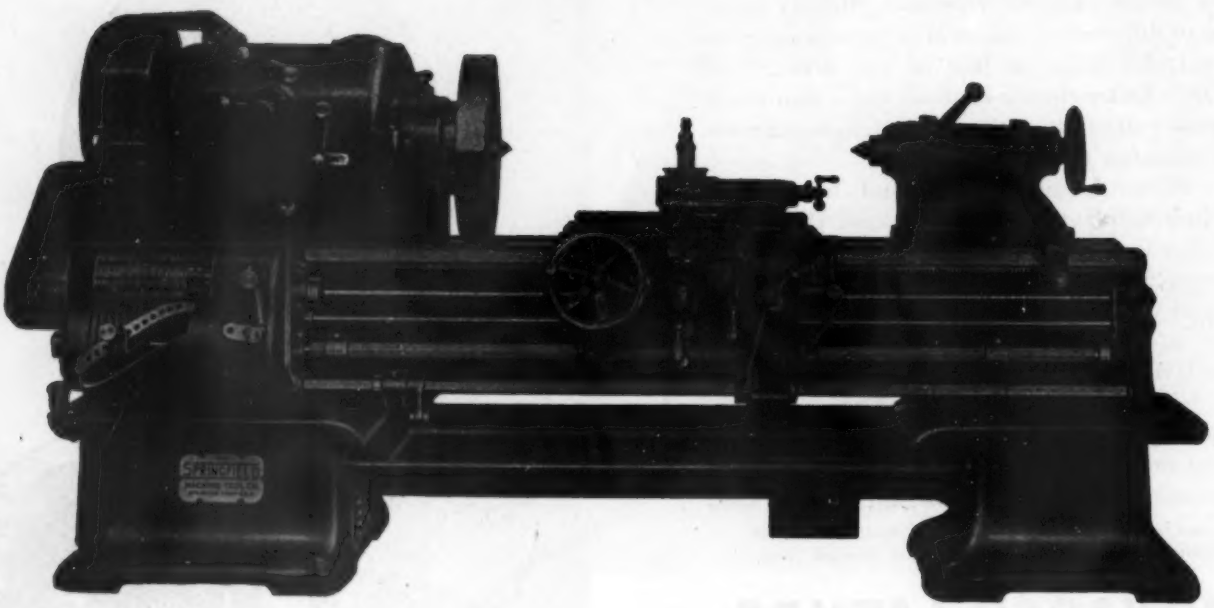


This MONARCH SHAPEMASTER is producing the shape and contour from a master cam and a thin metal template. You can produce one unit or any number in less time and at lower cost with this machine. This Monarch development was made before the war, and accepted by industry, but production was discontinued to meet demands for our standard lathes for the War program. Now, it is again part of the Monarch line.

FOR CONTINUED ACCURACY OVER A GREAT NUMBER OF YEARS

SPRINGFIELD

PRECISION LATHES



● Extreme accuracy and long life obtained from Springfield lathes is due to the deep, well ribbed bed made from High Test Iron. Made in our own Foundry, we have found from exhaustive metallurgical and wear tests by professional laboratories and actual operation in the field that this material gives greater wear resistance, freedom from scoring and freedom from internal strains. As a result you get greater accuracy throughout the life of the lathe.

Designed right — built right — and made of scientifically correct materials — Springfield lathes are giving continued accuracy over a greater number of years.

Thinking in terms of heavy production demanded in war times and for the peace time output to follow, you can't go wrong with a Springfield lathe. Sizes range from 14" to 30".

The SPRINGFIELD MACHINE TOOL Co.

SPRINGFIELD OHIO U.S.A.

There are many GOOD THINGS AHEAD . . .

Fins applied to the sides of aircraft tires have been found to reduce wear. When the landing gear is lowered, the air pressure spins the wheels and reduces the scuffing of the tires in their first contact with the ground.

The formerly worthless scrub palmetto, which grows like a weed on the Gulf Coast of Florida, is now ready to supply material for wallboard, brushes, binder twine, upholstery, insulation, and for use as a reinforcement for plastics and Portland cement.

A plastic molding powder is being made from potato starch.

Some engineers foresee the time when the refuse of cities—garbage, ashes, paper, etc.—will be removed continuously by underground tubes and burned in large incinerators to furnish power.

Shells are being tested by a new variation of the old trick of dropping a coin on the counter. When dropped on metal plates, the perfect shells make a particular sound that is detected and reported by an electronic "ear".

A fine finish may be put on stainless steel inexpensively by means of a newly patented electrolytic process.

The strength of spot-welded aircraft joints is being successfully tested by X-ray.

Because of its peculiar stretch and slow recovery, as well as its light weight and resistance to rot, Nylon rope is expected to have many postwar uses where a shock absorbing effect is required.

A new flexible tubing is made of woven glass fiber covered with plastic.

A new street cleaner sucks up leaves and compresses them for fertilizer.

A new ignition cable is made of monel and is insulated with synthetic rubber and glass fabric.

Pure tungsten can now be produced directly from the ore by a newly reported electrolytic process.

A patent assigned to a large truck manufacturer permits the conversion of a regular truck to a half-track crawler.

The Office of War Information has an exhibit of new materials, methods, and products in the Social Security Building in Washington.

Echo sounders, intended to measure the depth of water under a ship, are being used to locate schools of fish.

Experiments are being made with alloys of wrought iron and nickel.

Machinery has been designed for the high-speed, mass-production baking of bread with infra-red lamps.

Neon lights will be standardized in 98 colors.

Several manufacturers of air-conditioning equipment are working on plans for a $1,000 unit suitable for a six-room house.

At least 30 aircraft parts of laminated plastic paper are in production.

Lamp bulbs are being made shatterproof by a coating of lacquer.

A new double-barrelled spray gun that can handle two fluids at once has just been patented.

A novel mail box answers audibly any spoken request for the zone number of any address in the city.

When you look ahead
Look at metal cutting costs

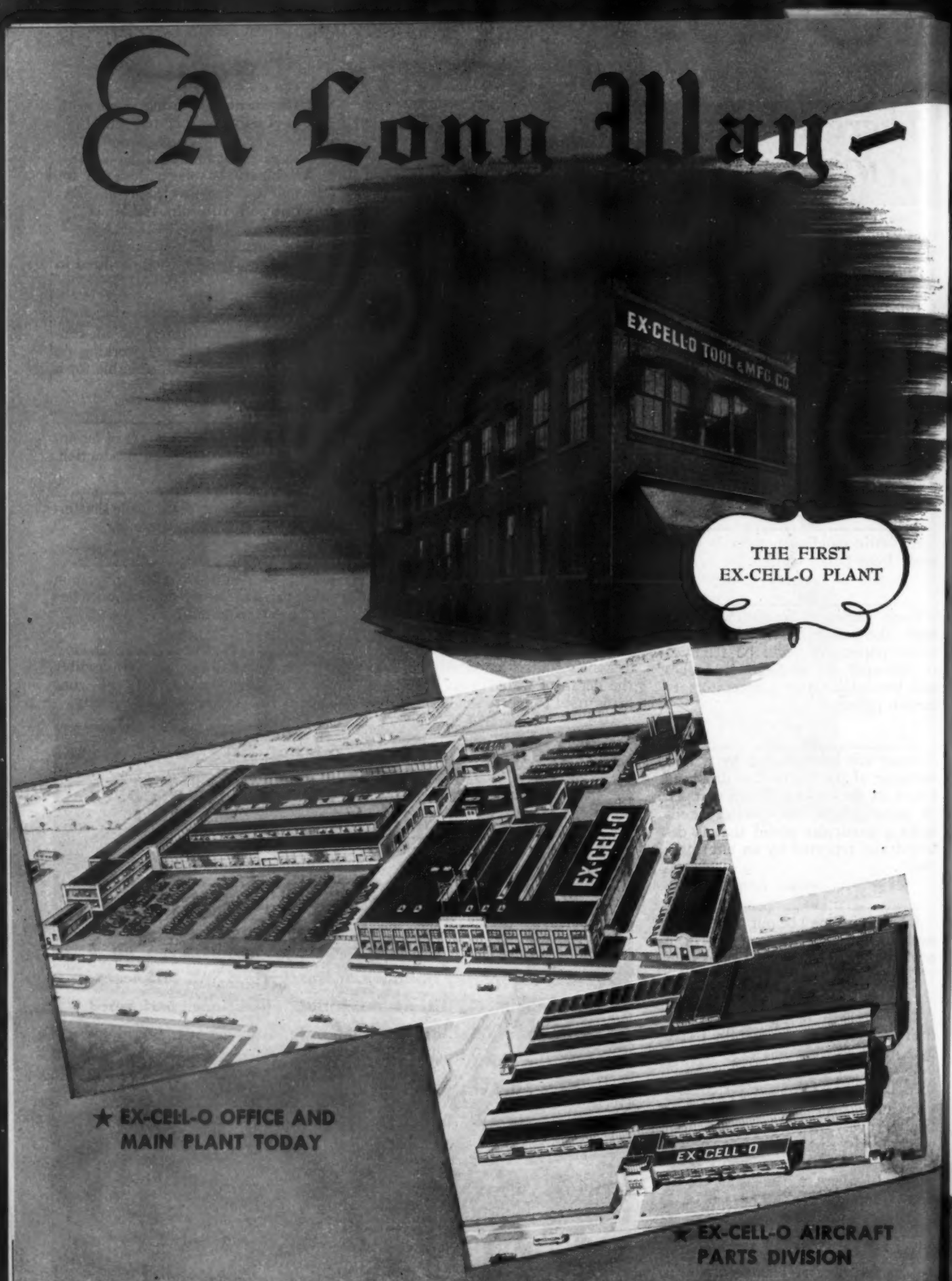
This part was produced on an 8 Spindle Conomatic from SAE 4615 seamless tube stock. The 16 machining operations, performed without rehandling, include hole and groove burnishing, threading, and internal recessing. Time—37 seconds. Conomatics cut metal cutting costs.

CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U. S. A.

6

A Long Way—

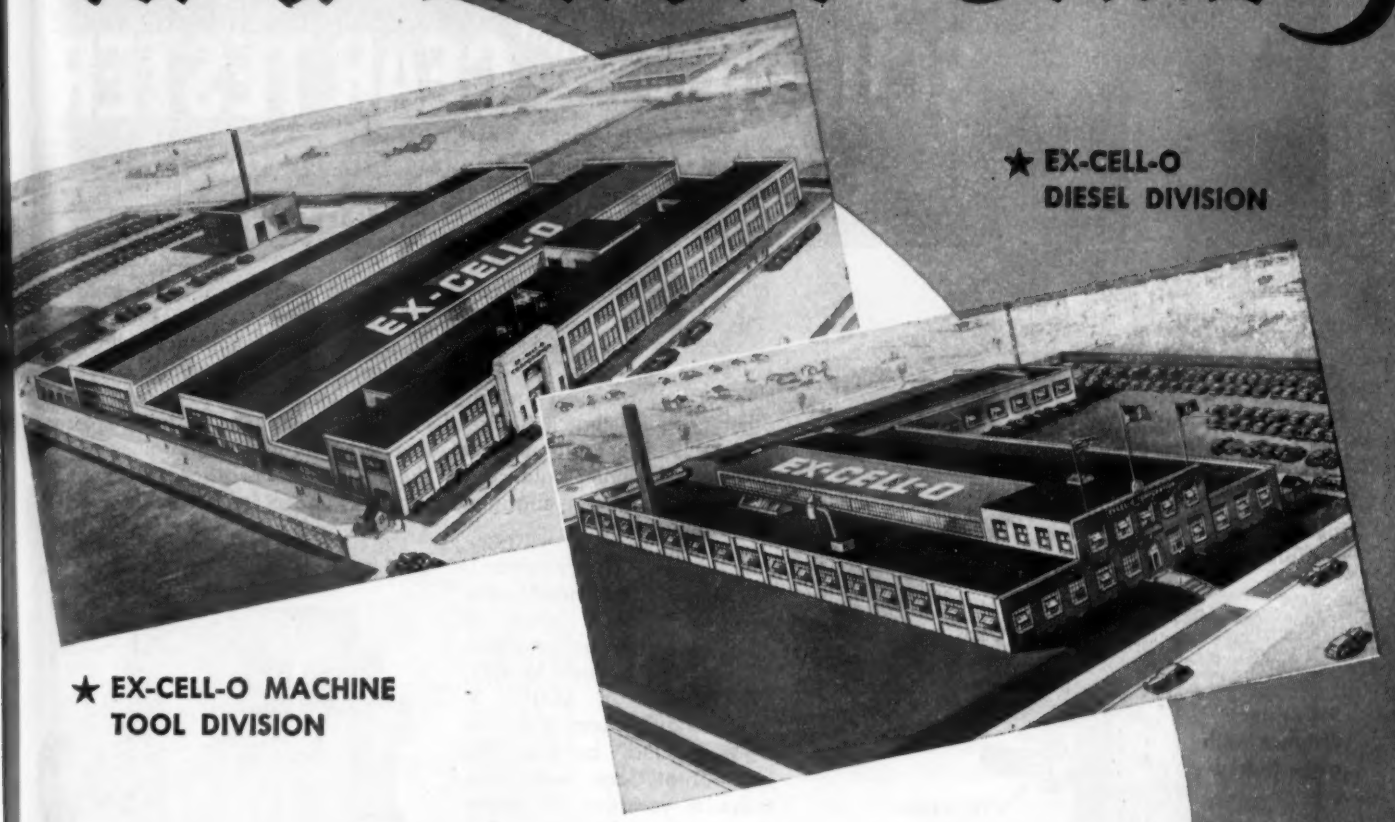


★ EX-CELL-O OFFICE AND MAIN PLANT TODAY

★ EX-CELL-O AIRCRAFT PARTS DIVISION

SPECIAL MULTIPLE WAY-TYPE PRECISION BORING MACHINES • SPECIAL MULTIPLE PRECISION DRILLING MACHINES • PRECISION THREAD GRINDING, BORING AND LAPPING MACHINES • BROACHES AND BROACH GRINDING MACHINES • HYDRAULIC POWER UNITS

in a Short Time



★ EX-CELL-O DIESEL DIVISION

★ EX-CELL-O MACHINE TOOL DIVISION

During its first 25 years

EX-CELL-O HAS MADE "PRODUCTION" HISTORY FOR THE NATION

Ex-Cell-O was founded a quarter of a century ago with a practical ideal—to bring to metal-working industries a new high standard for accuracy and speed in mass production. Steadfastly through the years it has progressed in this direction. Ex-Cell-O was the first company in the United States to design and manufacture and introduce for successful commercial use: *a precision ball bearing internal grinding spindle . . . a precision horizontal-type diamond boring machine . . . a precision thread grinding machine . . . a precision cylinder boring machine . . . a 1½ horsepower compact hydraulic power unit . . . a Diesel fuel injection pump and a universal-type Diesel engine nozzle . . . a machine to form and fill automatically square paper milk bottles in the dairy . . . Ex-Cell-O was also the first American company to undertake the mass production of hardened and ground precision parts for airplane engines.* If you are planning for tomorrow, when new standards will necessitate costs that are competitive, take advantage of Ex-Cell-O's wide engineering experience and extensive manufacturing facilities.

EX-CELL-O CORPORATION • DETROIT 6

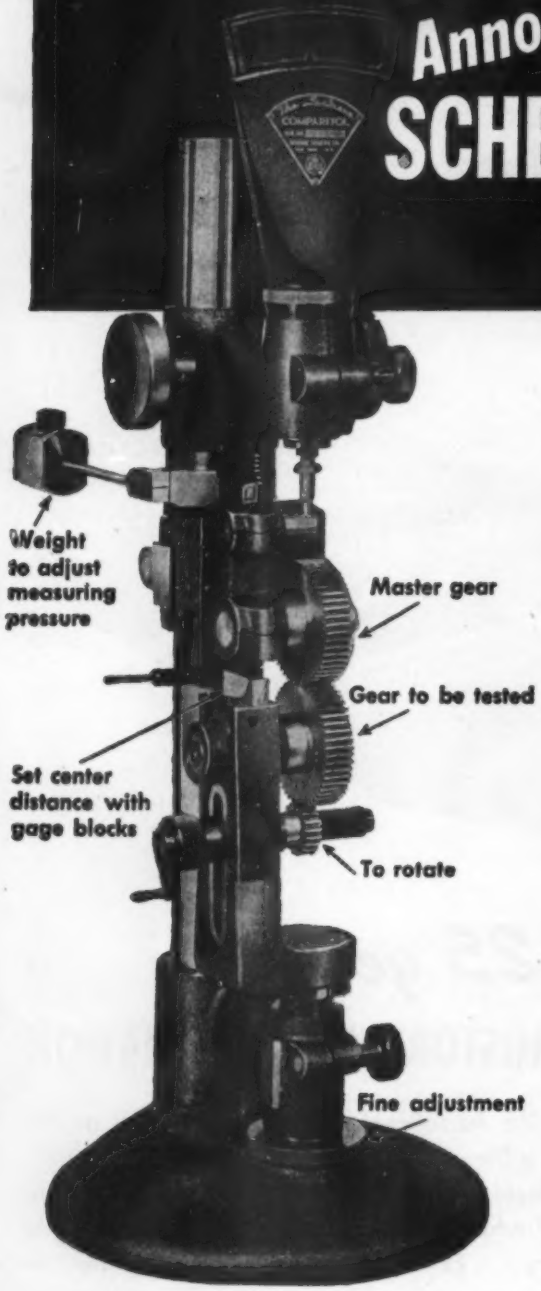
XLO

★ EX-CELL-O *for* PRECISION

GRINDING SPINDLES · DRILL JIG BUSHINGS · CONTINENTAL CUTTING TOOLS · TOOL GRINDERS · DIESEL FUEL INJECTION EQUIPMENT · R. R. PINS AND BUSHINGS · PURE-PAK MILK CONTAINER MACHINES · PRECISION AIRCRAFT AND MISCELLANEOUS PARTS

Announcing the NEW SCHERR Comparitol GEAR TESTER

for fast, accurate inspection of precision gears

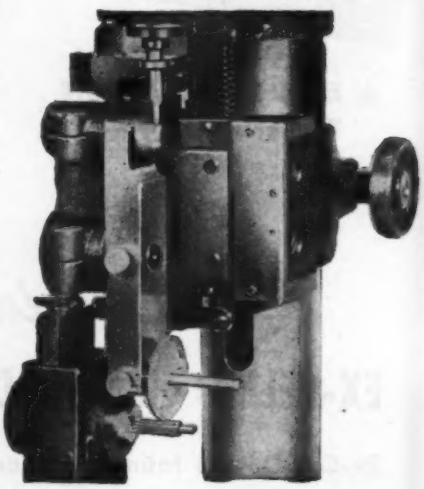


With the new SCHERR COMPARITOL GEAR TESTER, faults in gears can be easily and accurately detected. Center distance is quickly checked by setting up the instrument to proper distance with gage blocks or other standards. The master gear against which gears are checked is placed on an arbor and the gear to be inspected on another arbor so that it is directly in contact with the master. Pressure between master gear and tested gear is uniformly maintained by an adjustable counter-balance on the master gear bracket. A handle operating a pinion engaging the gear under inspection is used to rotate the gears.

Any divergence or error is quickly shown by readings in the Comparitol dial head. Depending on the class of work and precision required, it is possible to read to .001, .0005, .0025 or .0001". A wide range of gear sizes can be inspected, because the Comparitol Gear Tester provides a variation in center distance from 1" to 6".

Typical uses include: checking of rolling action between two working gears or gear and pinion; detection of gear eccentricity, variation of tooth thickness, involute errors, and off-center teeth. The Scherr Gear Tester can also be employed to check gear assemblies by giving indication of any run-out.

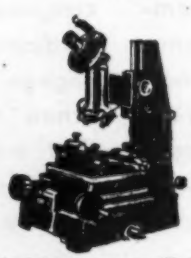
Write at once for complete details of the NEW SCHERR COMPARITOL GEAR TESTER.



Special attachment for Gear Tester for checking very small gears and pinions such as are used in instrument gearing. With this attachment gears down to 1/4" center distance can be accurately checked.

WILDER PROJECTOR for accurate measurement or comparing objects by means of a magnified shadow image.

SPENCER BINOCULAR MICROSCOPE with 3 dimensional vision, reveals surface finish, imperfections, etc.



TOOLMAKER MICROSCOPE that simplifies the magnified projection of part profiles and provides direct measurement in two dimensions as well as angular measurements.

MAGNI-RAY—a wide field illuminated magnifier for close inspection of work and operations.

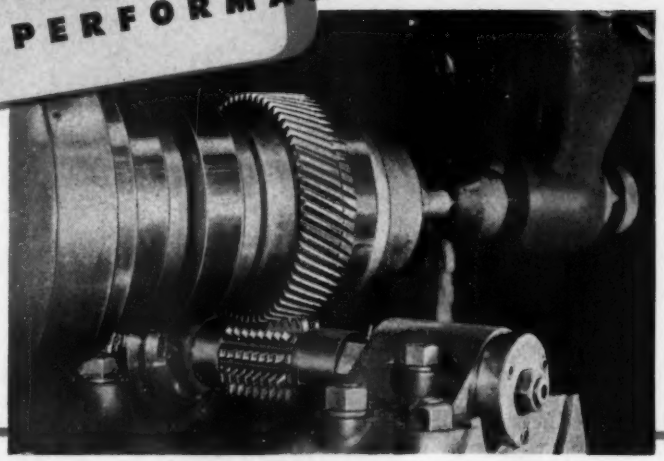
OPTICAL FLATS—for testing gages and lapped parts for parallelism and flatness.

GEORGE SCHERR CO.
INCORPORATED
200 LAFAYETTE STREET NEW YORK 13, N. Y.

ANOTHER EXAMPLE OF

BARBER-COLMAN

HOBBING MACHINE PERFORMANCE

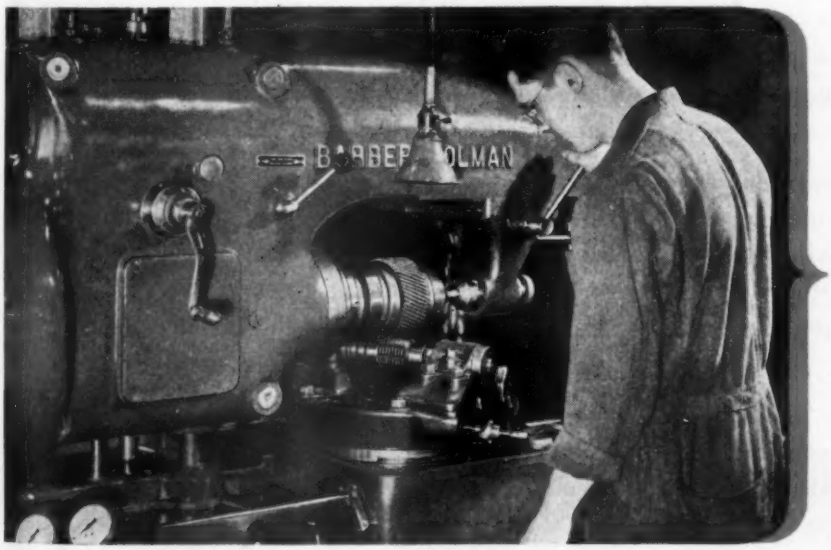


TYPE "D" HOBBING MACHINE

This machine is designed for accurate, heavy duty, high production manufacturing. An outstanding feature is the *hydraulic* drive and clamping mechanism, which produces smoother operation and finer finish on heavy cuts.

HUSKY HELICAL GEARS
FOR MILLING MACHINES . . .

This particular gear calls for a very high degree of accuracy as well as fine finish. The job is hobbed with *one-cut climb hobbing.* Material is SAE 3145 steel with a hardness of 197 Brinell. Two gears, back to back, constitute a load, clamped on a special arbor with supporting collars. Accuracy requirements are good finish and check within .001″/.0015″ runout, +.001″ −.0000″ over pins.



20 GEARS CUT IN 8 HOURS CLIMB HOBBING...GOOD FINISH REQUIRED IN TOUGH MATERIAL

Gear Specifications..10.86 pitch, 6.58″ O.D., 1¼″ face, 64 teeth, 23° helix, 20° P. A., Involute form.
Feed..... .100″ per min.
Feed per Rev. of work..... .040″
Hob Speed..... 103 r. p. m.
Hob.....3″ O. D. x 3″ length x 1¼″ straight hole, ground, single thread, non-topping.
No. of settings..... 2
Pieces per setting..... 12
Pieces per grind..... 24

BARBER B-C COLMAN PRODUCTS: HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

Barber-Colman Company

GENERAL OFFICES AND PLANT • 111 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

The Man at the Lathe Fights Too!

...and every turn of the spindle, as he guides his work through many precision operations, helps bring Victory one step closer.

Hours spent at a lathe may lack the dangerous excitement of combat—but the valorous men on the battle fronts breathe a prayer of thankfulness for guns, shells, planes, tanks—for all the superb equipment which is helping them swing the tide against the Axis.

So the man at the lathe is a soldier, too, as he bends his shoulders to the task of pouring out weapons in an ever-increasing stream. He faces his task grimly... proudly... proclaiming by the gleam in his eye and the jut of his jaw that he will not be outdone in service to his country, and knowing that America's production is a decisive factor in the war.

To help America "tool up for Victory," the output of South Bend Lathes has been increased (we can't say how much) in the last year and a half—giving the man at the lathe the efficient, dependable production weapon he must have to win.

There is a South Bend Lathe for every class of work—engine lathes, toolroom lathes, and turret lathes. Write now for our new catalog No. 100B in which the entire line is illustrated and described.

SOUTH BEND LATHE WORKS

LATHE BUILDERS FOR 37 YEARS

SOUTH BEND 22, INDIANA

PREVIOUS concepts of abrasive engineering have been blasted! Previous notions of "finest obtainable" finishes . . . of maximum wheel life . . . of highest production speeds . . . have been blown to bits!

A trifle dramatic, you think? Perhaps, if applied to anything less revolutionary than MICROGRIND #132. But not at all exaggerated when you consider that this *fundamentally different* grinding coolant makes it possible to —

- **Completely eliminate "pick-up", tears, etc.**
- **Reduce grinding checks to a point substantially less than ½ of 1%.**
- **Totally eliminate burning.**
- **Eliminate 2 out of every 3 wheel dressings.**
- **Considerably increase speeds and feeds.**
- **Control distortion.**
- **Develop superfine finishes, free of glaze.**
- **Increase wheel life as much as 300%.**

If *your* work involves grinding, honing or superfinishing operations, you'll surely want the full story on MICROGRIND #132. A *Quaker Process Engineer* will gladly call and explain the new concept of abrasive action around which this product has been developed and upon which its most successful application depends. If you wish, he will gladly bring in enough MICROGRIND #132 to run a test right on your own machines. Simply fill in and mail the handy reply form below.

QUAKER CHEMICAL PRODUCTS CORP.
CONSHOHOCKEN, PA.

Other Plants in CHICAGO and DETROIT Warehouse Stocks in Principal Industrial Centers

For more information on MICROGRIND #132 fill in below, tear out and mail.

A Progressive Organization of Research and Process Engineers and Manufacturing Chemists

Name_____ Position_____

•••PLEASE PRINT COMPANY NAME AND ADDRESS IN MARGIN BELOW•••

OHIO DREADNAUGHT SHAPERS

OHIO
STEP BY
PRODUCTION

Orders for Ohio Dreadnaught Shapers are now being shipped with reasonable promptness.

This 36" Ohio Super-Dreadnaught Shaper is suited particularly to troublesome, large, odd-sized jobs. Table, 30" x 48". Ram bearing in column, 56" x 15". Length of ram without head, 80". Long ram allows 36" of stroke at any position on table or if job projects beyond front of table. Maximum distance from drop table (when furnished) to ram, 30". Weight of standard machine, 13400 lbs. Complete range of standard accessories available, especially attachments for railroad work.

ASK FOR OUR BULLETIN NO. 59.

☆

• Ohio Dreadnaught Shapers answer the insistent demand for top production with their ample power, heavy duty design and construction, and reserve capacity. These features enable them to machine bigger and still bigger parts and more and more of them. One-position control makes the machine "easy on the man." In-built rigidity promotes fast, accurate work. Convenience and flexibility heighten production. Many accessories and attachments are available to meet your individual requirements.

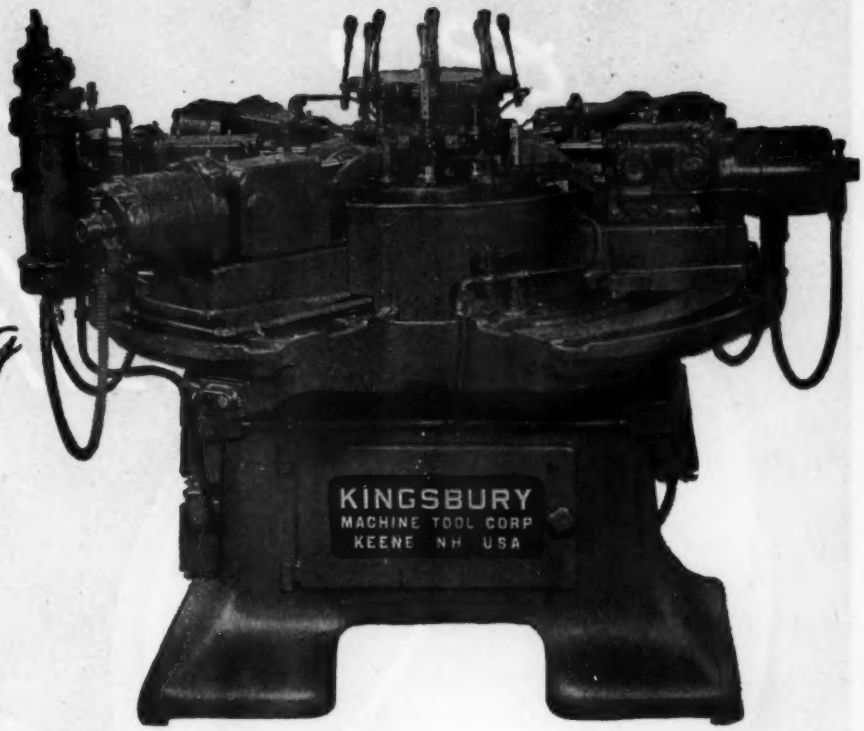
Orders for Ohio Dreadnaught Shapers are now being filled with reasonable promptness. Better indicate your needs at once.

THE OHIO MACHINE TOOL COMPANY • • KENTON, OHIO

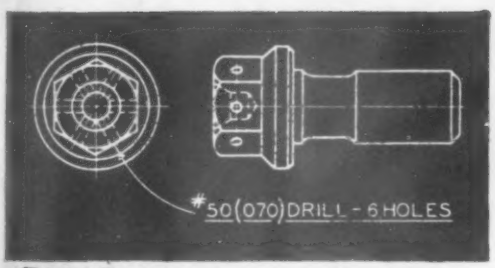
OHIO DREADNAUGHT

HORIZONTAL BORING, DRILLING AND MILLING MACHINES · SHAPERS · PLANERS

Loading and Unloading While Drilling assures Continuous High Production



FLEXIMATIC



by KINGSBURY

THIS IS A FLEXIMATIC AIRPLANE JOB!

Kingsbury Standard Units for drilling, reaming, boring, spotfacing and milling can be mounted in any combination, operated automatically and changed over quickly and easily to suit the requirements of the work to be handled.

This six-spindle FLEXIMATIC is set up for drilling lacing holes in the heads of screws for airplane motors. High production, so essential to parts involved in the speeded up program of this important phase of National Defense, is being achieved with minimum effort on the part of the operator.

The main turret of this FLEXIMATIC contains eight individual turrets which index 60° at each index of the main turret. Each of the six automatic drilling units on the machine drill a hole from the outside face of the hex head into the center only. The operator merely loads and unloads at the loading station while the holes are being drilled at the other stations on the machine. All six drilling operations are performed in a single chucking of the work.

Speed, convenient handling, accuracy and continuous production are universally recognized advantages offered by FLEXIMATICS regardless of the nature of the job assigned them to handle. The specific work being performed here is typical of many others where FLEXIMATICS are the machines for jobs calling for the maximum in time savings.

KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U S A

Eliminate the "RISING SUN"

NORTON GRINDERS
and Lappers

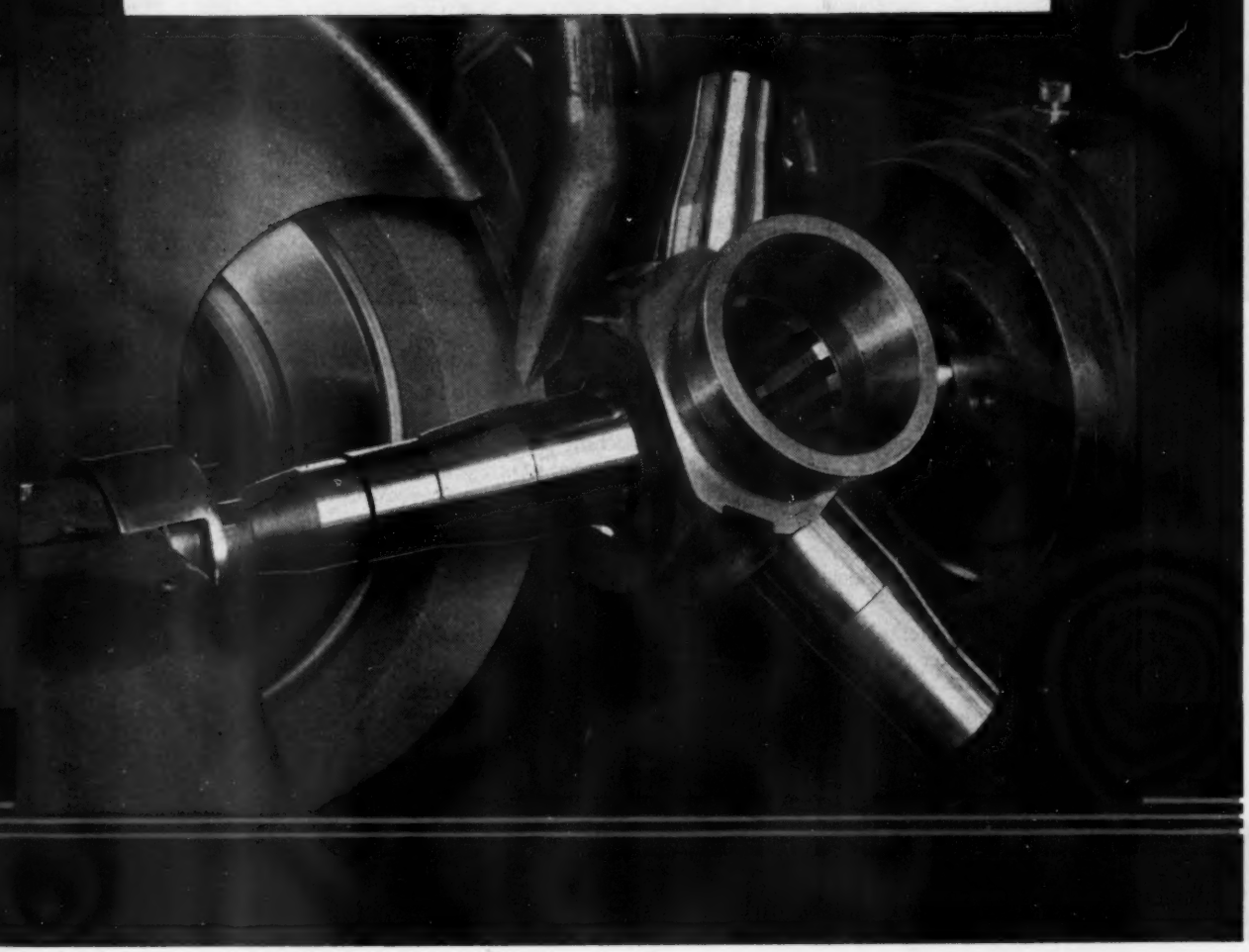
NORTON 45° ANGULAR WHEEL SLIDE GRINDER GIVES *SUPERIOR BEARING SURFACES*

THE "sun-burst" effect resulting when work is ground with the side of a straight wheel has distinct disadvantages when the surface is to be used as a thrust bearing. Work finished in the Norton Type C Grinder with 45° angular wheel slide however, has grinding lines both on the cylindrical and shoulder or flange portions of the work, concentric with the axis. This type of grinding produces superior rotating bearing surfaces because of initial wear reduction and retention of lubricants.

Such surfaces may be obtained in the Norton 45° Grinder in simultaneous or consecutive grinds on cylindrical and flanged portions — and in a single machine set-up. The straight-line wheel contact on the work gives desirable grinding performance and wheel life as well as superior surface finish.

NORTON COMPANY, WORCESTER 6, MASS.

M-482



Meet Mr. Quality

ONE LOOK AT Bill Seebode — 50 year man at Allis-Chalmers Norwood Works — tells you that he sleeps well nights.

One reason is that he and hundreds of his fellow craftsmen at Allis-Chalmers have won *and are keeping* the confidence of engineers and operating men throughout American Industry.

That means a lot to veterans like Bill who've made a career of building great motors.

Bill's a stator-winder, as you can see—a living example of the truism that *men* make motors.

No machine known can assemble the maze of wiring and insulation that goes into a stator with his skill and care. No machine can fully test how *well* he's done his job.

There's only one test . . . wait 5, 10, 15 years and *see*.

And that's the test that has proved Allis-Chalmers motors are *great* motors. That's why you hear it said so often: *"You can depend on Allis-Chalmers Motors!"*

Yes, hundreds of Allis-Chalmers men—*quality* men like Bill Seebode — know they have a big personal stake in every Allis-Chalmers motor. When they build a great motor for you, they're making a friend . . . and they know that's something no company and its workers can have too many of. ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN.

• • •

♪ *Tune in the Boston Symphony, Blue Network, Saturday at 8:30 pm, EWT.*

AC VICTORY PEACE

A 1729

YOU CAN DEPEND ON ALLIS-CHALMERS MOTORS

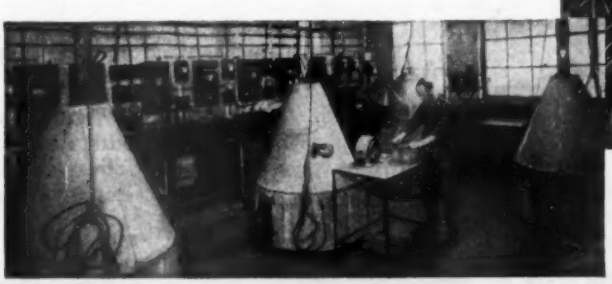
DOSE OF SALT

Encrusted with chemical salts, this Tri-Clad motor continues to drive a pump without breakdown of its insulation. In almost every industrial plant, motors are called upon to keep going under conditions which try their endurance to the limit. It may be in a plating room, or on an exhaust fan, or in a wet sub-cellar, or — as in this case — in connection with chemical processing. In emergencies, open motors may face conditions for which good engineering practice would require totally enclosed construction — conditions which tend to corrode the frame and attack the insulation. Endurance of Tri-Clad motors under such conditions results from tests like the one described below.

Salt-spray test of TRI CLAD motors gives assurance of long life in severe service

IN this accelerated life test to determine the ultimate endurance of their insulation, the motors are operated to failure under one of the worst possible combinations of conditions. They are continually exposed to a 2% salt-water spray, while operating on a duty cycle of 3 minutes on and 37 minutes off. (These repeated voltage surges impose greater stress on the insulation than would continuous operation.) Tests are run on all new insulations developed, and as a production check on motors taken at random off the assembly lines. Because of their endurance under this severe test, among others, Formex* wire and Glyptal* bonding material were chosen for Tri-Clad insulation.

*Reg. U. S. Pat. Off.

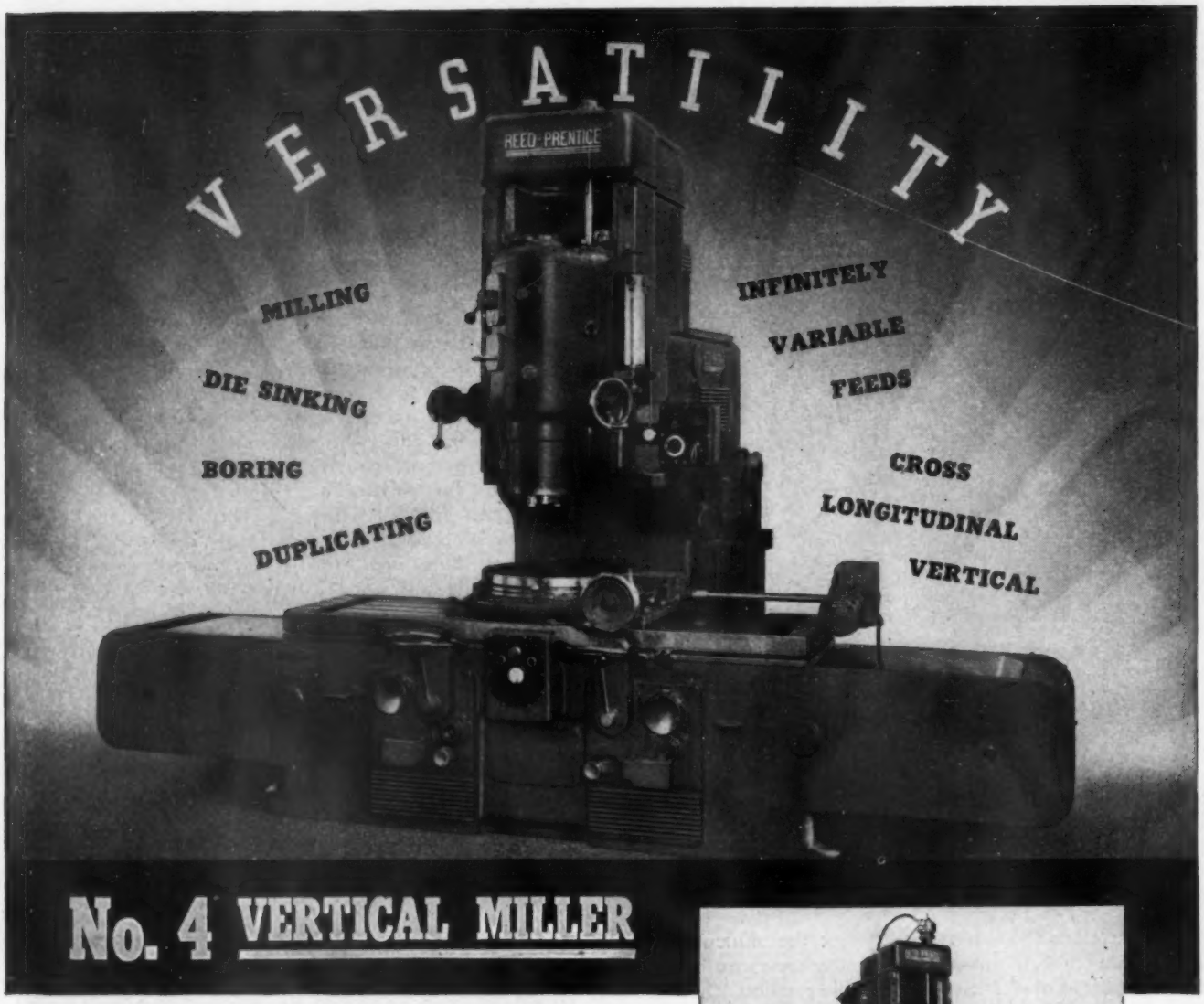


Left: Conical hoods cover the tanks in which these salt-spray tests are conducted.

GENERAL ELECTRIC

TRI CLAD MOTORS

Every week 192,000 G-E employees purchase more than a million dollars' worth of War Bonds.

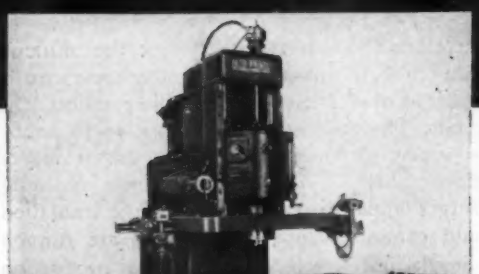


No. 4 VERTICAL MILLER

Whatever your requirements for accurate heavy duty milling, die sinking, or boring, the Reed-Prentice No. 4 deserves your consideration.

- ▶ Table and cross slide movement through hydraulically actuated screws giving infinitely variable feed rates.
- ▶ Power down feed controlled through electronic unit for smooth and infinitely variable feeds.
- ▶ All controls centralized within easy reach of operator.
- ▶ Large table, 24" x 84". Longitudinal travel 48". Cross slide travel 24".

Our sales engineers will be pleased to supply you with complete details.



NO. 4 MILLING MACHINE EQUIPPED WITH DUPLICATING ATTACHMENT

Duplicator can be supplied with either dual unit for two dimensional profiling or single unit for vertical die sinking. Extremely rapid reproduction can be effected, even with inexperienced operators.

BRANCH OFFICES
1213 W. 3rd. St.
Cleveland. Ohio
75 West St.
New York City. N. Y.

REED-PRENTICE CORP.

MAIN OFFICE
WORCESTER
MASS. U. S. A.

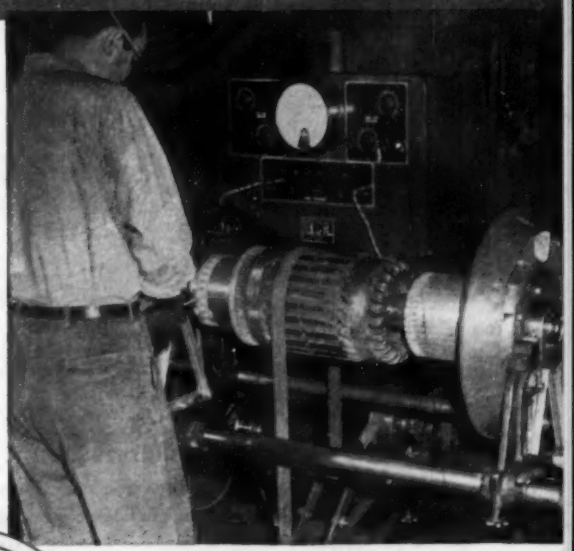
WHICH ARMATURE WOULD YOU PICK?

OF COURSE you'd want the one that will perform most efficiently, without noise or vibration—the one that will live the longer.

Sure, they look exactly alike. But there's far more than meets the eye in comparing them. It's the factor of static and dynamic balance. *That's* what determines their relative value to the user.

To eliminate guesswork and make sure that *every* armature will deliver the utmost in faithful service, alert manufacturers are correcting their unbalanced forces in the approved manner—with Gisholt Dynetric Balancing Machines*. If your product uses rotating parts, write Gisholt for complete information on your specific balancing problems.]

**A development of Westinghouse Research Laboratories*



DYNETRIC BALANCING
assures smooth vibrationless performance in electric arc-welding generators. This large manufacturer balances the entire rotating assembly, including the fan as a complete unit.

GISHOLT MACHINE COMPANY
1201 East Washington Ave. • Madison 3, Wisconsin

Look Ahead . . . Keep Ahead . . .
With Gisholt Improvements

GISHOLT

RET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

FEDERAL BEARINGS

This famous trade-mark . . . an eagle and ball bearing . . . has always been associated with the name "FEDERAL". It is a symbol of QUALITY . . . a mark of distinction . . . familiar to engineers and manufacturers in every important industry.

THE FEDERAL BEARINGS CO., INC.

Makers of Fine Ball Bearings

POUGHKEEPSIE, N. Y.

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Detroit: 2640 Book Tower • Cleveland: 402 Swetland Building
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DOORWAY TO PRECISION

TOOLS -- Immediate delivery on standard carbide tools tipped with general purpose grades for a wide range of machining operations.

GAGES -- Immediate deliveries on standard thread, plug, and ring gages.

SEND FOR *Catalog No. 102*

Gives complete details on our line of carbide-tipped tools and precision gages.

SPECIAL TOOLS and GAGES to your specifications. Let our engineers help you with your tooling or gaging problems.

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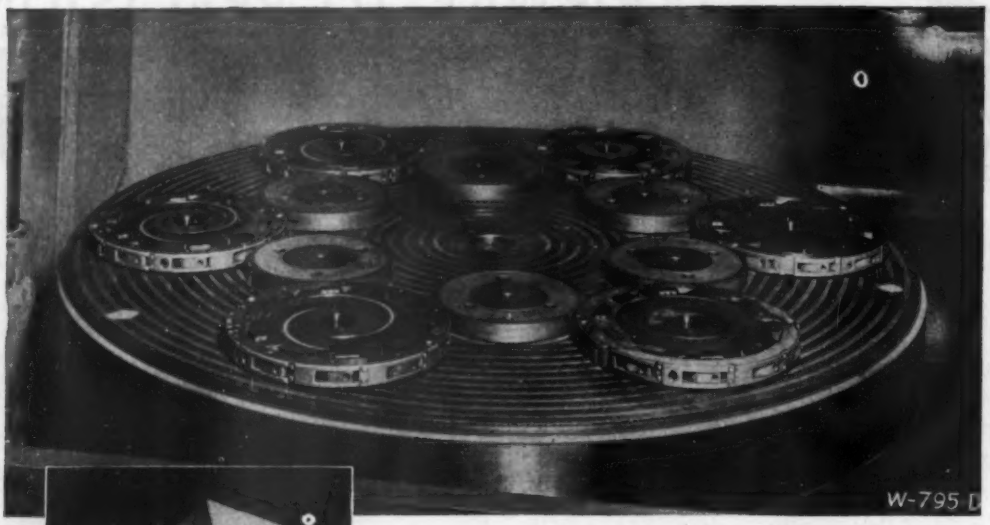
TOOL AND GAGE CO.

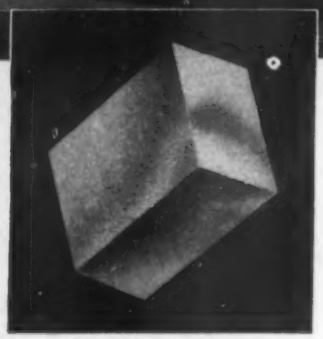
4240 PETERSON AVE.

CHICAGO, 30, ILL.



The advantages of BLANCHARD *grinding*

Production
Adaptability
Fixture Saving
Operation Saving
Material Saving
★Fine Finish
★Close Limits
★Flatness



Actual Size of Blade

★*Fine Finish* ★*Close Limits* ★*Flatness*

Grinding Hardened Steel Refrigerator Blades

These refrigerator blades are ground square to .0001″ on each end.

For the first operation the blades, held in special fixtures, rest on supporting plates. After grinding one end, the fixtures are turned over with the ground end of the blades resting directly on the magnetic chuck, thus insuring greater accuracy. The photograph shows them ready for this second operation.

Sixty blades are on the chuck at one time, .006″ of stock is removed from each end and production is at the rate of 200 pieces (400 surfaces) per hour.

The *"Put it on the Blanchard"*

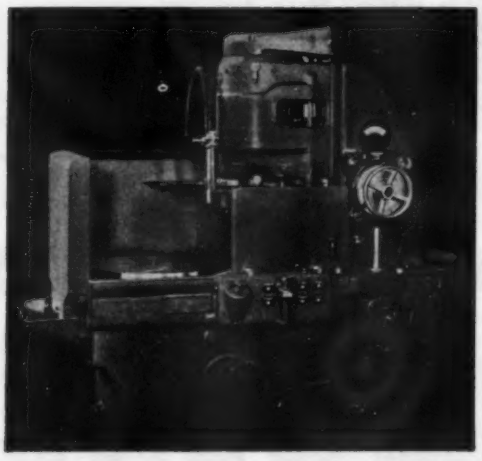
BLANCHARD MACHINE COMPANY

64 State St., Cambridge 39, Mass.

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

BLANCHARD

This job being done on the No. 18 Blanchard Surface Grinder



A New TOOL ROOM GRINDING WHEEL by MID-WEST

--- The MID-WEST Super-Cut

AN ideal tool room wheel, engineered specifically for unusually fast stock removal and extremely fine finishing of hard, high speed tool steels.

An open structure wheel, the MID-WEST SUPER-CUT is made with an exclusive MID-WEST developed abrasive that assures an even spread of grain, prevents "hard spots" and guarantees an absolutely uniform grade.

MID-WEST SUPER-CUT wheels are manufactured in two distinct types—red and white—and with a range of grain and grade sufficient to handle any high speed steel tool operation.

For hardened or unhardened alloy or high speed steels specify MID-WEST SUPER-CUT wheels. You will find they

CUT FASTER* CUT COOLER* LAST LONGER* LEAVE FINER FINISHES*

* *These claims are based on many months of actual operation in high production plants throughout the United States. Ask our engineers to furnish you with specific examples of MID-WEST SUPER-CUT wheel performances. Or mail the coupon printed herewith.*

MID-WEST ABRASIVE COMPANY

Manufacturers of DEPENDABLE Abrasives

Owosso, Mich. — **1960 E. Milwaukee Avenue, Detroit 11, Mich.** — **Rochester, Pa.**

Mid-West Abrasive Company,
1960 E. Milwaukee Avenue,
Detroit 11, Mich.

Gentlemen:

Please send me additional details about MID-WEST SUPER-CUT high speed steel grinding wheels.

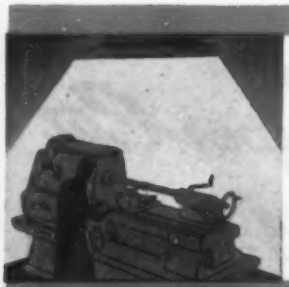
Name .....

Address .....

City .....

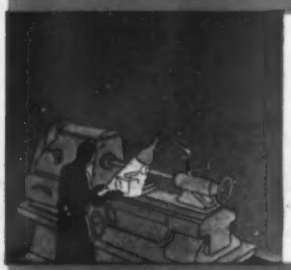
IMPROVE AND INCREASE PRODUCTION WITH

Proportional lighting



NOT THIS

Good general lighting alone may not always provide adequate light on very critical work areas.



NOT THIS

Intense localized lighting with too little general illumination tends to cause eyestrain.

BUT THE RIGHT COMBINATION

"Proportional Lighting", a ratio of 1 to 5 between general and localized lighting, makes for best seeing conditions.

GENERAL + SUPPLEMENTARY = PROPORTIONAL LIGHTING

In many machine operations, and in precision inspection and assembly work, 100 to 300 footcandles are needed for quick, accurate vision. Good overhead lighting often does not meet these intensities . . . or is nullified by shadows cast by a machine or the worker himself.

To solve this lighting problem, Westinghouse recommends proportional lighting . . . which is the right combination of general and supplementary lighting. Proportional lighting improves and increases production—because it enables workers to adhere more closely to "specs"—perform their job with confidence and precision—thus increasing their output.

For supplementary lighting . . . Westinghouse offers a complete new, flexible line of Focalaires. Full details are given on the opposite page. For additional information and prices—call your nearest Westinghouse distributor. J-04005

Westinghouse

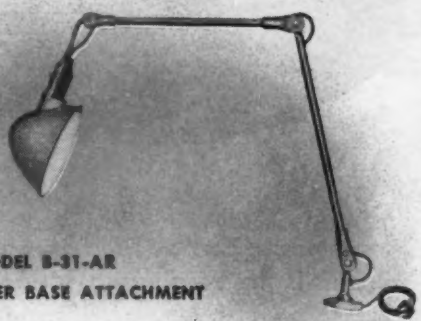
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Lighting Equipment

6 WESTINGHOUSE FOCALAIRES...FOR INSTALLATION ON MACHINES, BENCHES, TABLES

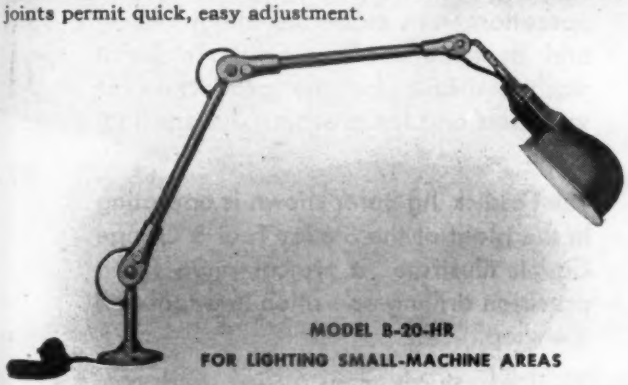
MODEL G-31-AR
FOR BENCH AND TABLE OPERATIONS

Supplies 300 footcandles on the critical area. Reflector shields light from worker's eyes and concentrates it on a 28″ circle. This unit is 51″ in length, from bottom of base to outside edge of reflector. Base 8″, arms 11½″ and 16½″, reflector assembly 12″ long.



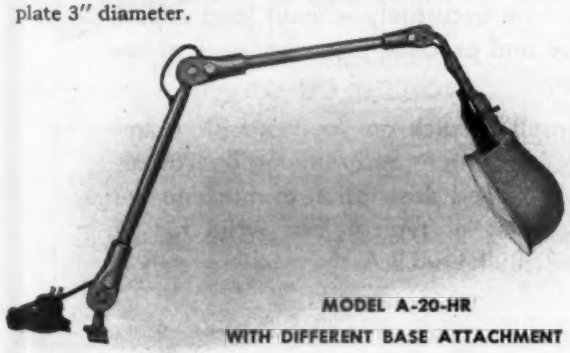
MODEL B-31-AR
WITH SHORTER BASE ATTACHMENT

Identical with Model G-31-AR above, except that the base is only 5⅛″ high, making the over-all length 48⅛″. Ball-clip joints permit quick, easy adjustment.



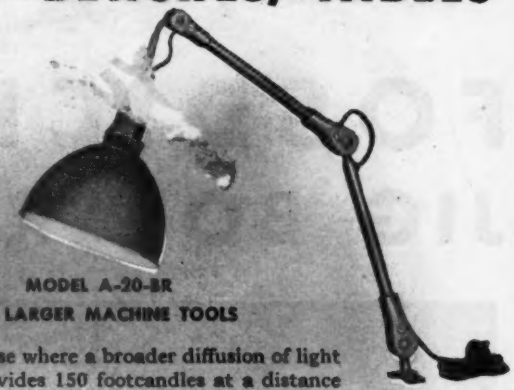
MODEL B-20-HR
FOR LIGHTING SMALL-MACHINE AREAS

Provides more than 200 footcandles 12 inches from the reflector, on a work area 20″ by 16″. Over-all length is 35⅝″, base 5⅛″, arms 10½″ and 9½″, reflector assembly 10½″. Circular mounting plate 3″ diameter.



MODEL A-20-HR
WITH DIFFERENT BASE ATTACHMENT

This unit is the same as Model B-20-HR except that it has a short 1¾″ base and narrow type of mounting bracket.



MODEL A-20-BR
FOR LARGER MACHINE TOOLS

Designed for use where a broader diffusion of light is desired. Provides 150 footcandles at a distance of 12 inches from the reflector. Over-all length is 32″, base 1¾″ high, arms 10½″ and 9½″, reflector assembly 10¼″. Bracket-type base can be mounted in a space 3″ by 1″

MODEL G-20-BR
WITH TALLER BASE ATTACHMENT

Similar to Model A-20-BR above, this unit has a base 8″ high, with a circular mounting plate. Over-all length is 38¼″.

IMPORTANT FEATURES OF THE WESTINGHOUSE FOCALAIRE

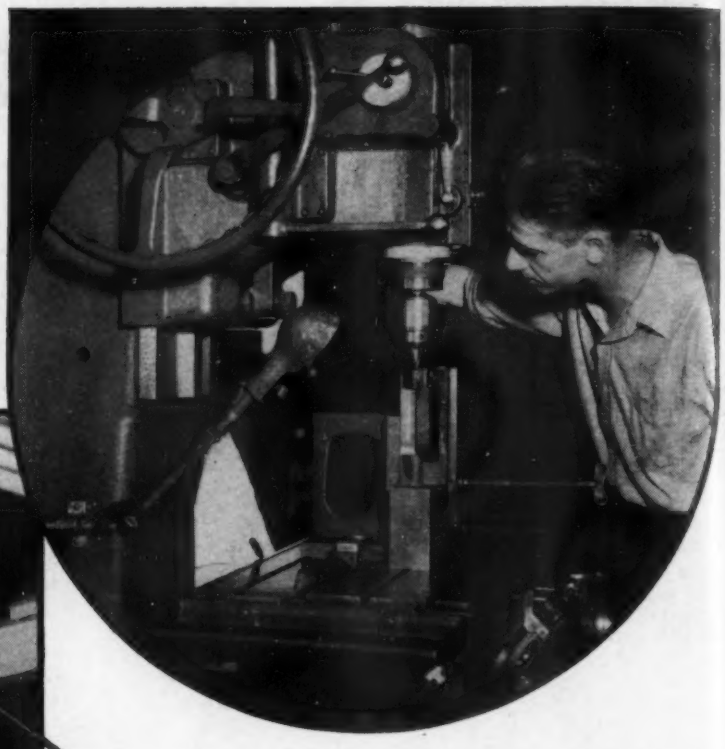
1. Quickly adjusted by simple ball and socket joints.
2. Shake-proof—resists vibration of machine.
3. All parts are welded for strength.
4. Wire is run inside of tubular arms and has oil-resistant insulation.
5. Reflector is spot-welded to socket guard.
6. Furnished in 6 standard types, with regular machine tool gray finish.
7. Special sizes can be made up from standard part of arms, reflectors and bases.

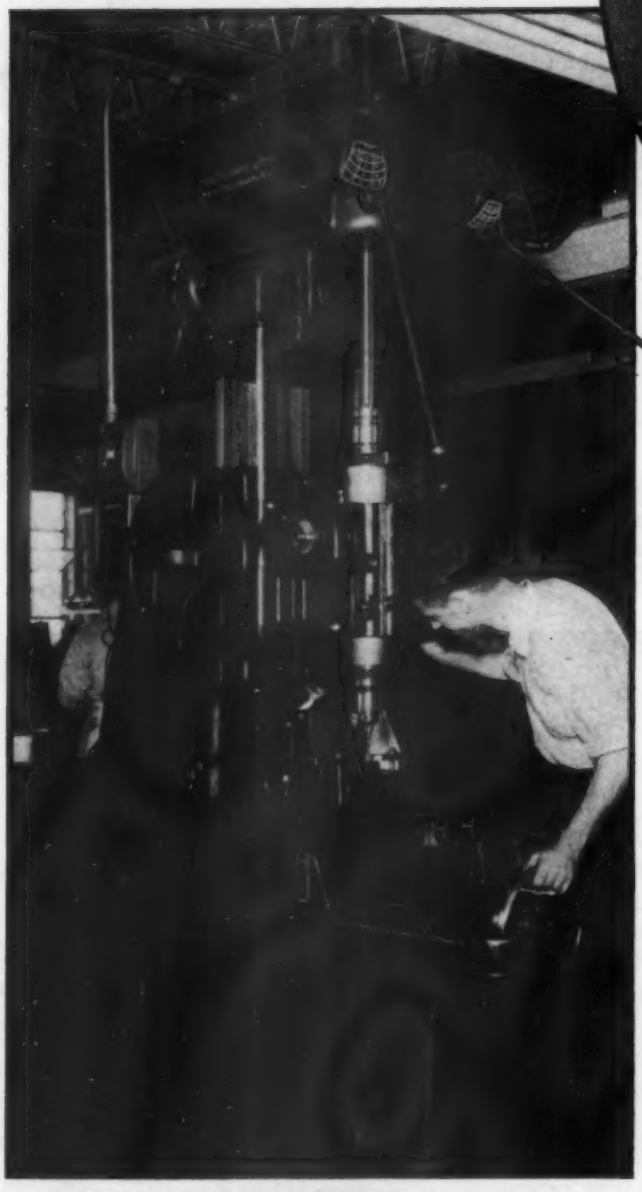
Westinghouse

FOCALAIRE

Wherever Tools and Dies are made you'll find

FOSDICK JIG BORERS





One of the most useful and economical machines in Tool & Die Shops and Tool Rooms is the Fosdick Jig Borer.

Its versatility in handling a wide variety of work — its simplicity of control and operation — its moderate initial cost — and its dependable precision make it most desirable for the production of small lots and for precision die and tool work.

The Fosdick Jig Borer shown is operating in the plant of the Stellar Tool & Gauge Co. It illustrates a typical setup for a precision drilling operation in a tool and die shop.

Its rigid, sturdy construction and conveniently located controls enable the average shop man to operate the machine accurately without long experience and produce precision work at low cost.

Consult Fosdick on your precision drilling — boring — and reaming operations. For detailed description of machine and examples of typical jobs write for Jig Borer Bulletin J.B.A.

ARMY E NAVY

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

TODAY'S HIGH PRODUCTION PRECISION MILLING BEGINS WITH MOTOR POWER

In years past it was customary to purchase milling machines by range . . . depending on the size of work to be handled. The motor power was given insufficient consideration by most purchasers. For example, a model 2 machine with 3, 5 or 7½ hp. served practically all requirements in those days.

Today, however, with the constant changing of milling techniques, range is not the first consideration—hp. becomes the *number one factor* . . . the *starting point* when purchasing milling equipment. No machine which is engineered to handle work requiring from 3 to 7½ hp. can be expected to stand up very long if 15 to 20 hp. is substituted on the spindle.

You can always be sure that a Kearney & Trecker "Milwaukee" is correctly designed in terms of motor power, from the drawing board stage on through to the completed machine. Milwaukee Milling Machines are power-engineered — POWERATED — designed and built in keeping with their hp. range plus the normal overloads encountered within their field of job applications.

The next time you need milling equipment, think in terms of motor HP. for heavy cuts — range for light cuts. Consult a Kearney & Trecker field engineer. Explain to him the types of jobs which you intend milling. He will help you in deciding what PoweRated Milwaukee Milling Machine is best best suited to your specific needs.

PoweRated
Engineered for a Specific HP. Range

MEANS EVERY MILWAUKEE MACHINE IS POWER ENGINEERED TO DO THE JOB

Milwaukee *PoweRated* Milling Machines • Standard Models—Horizontal, Vertical and Bed Types — available in Motor ranges from 3 to 25 HP. • C.S.M. (Carbide Steel Milling) machines 20 to 50 HP. • Special Machines—Consult K&T engineers

KEARNEY & TRECKER CORPORATION
MILWAUKEE 14 WISCONSIN

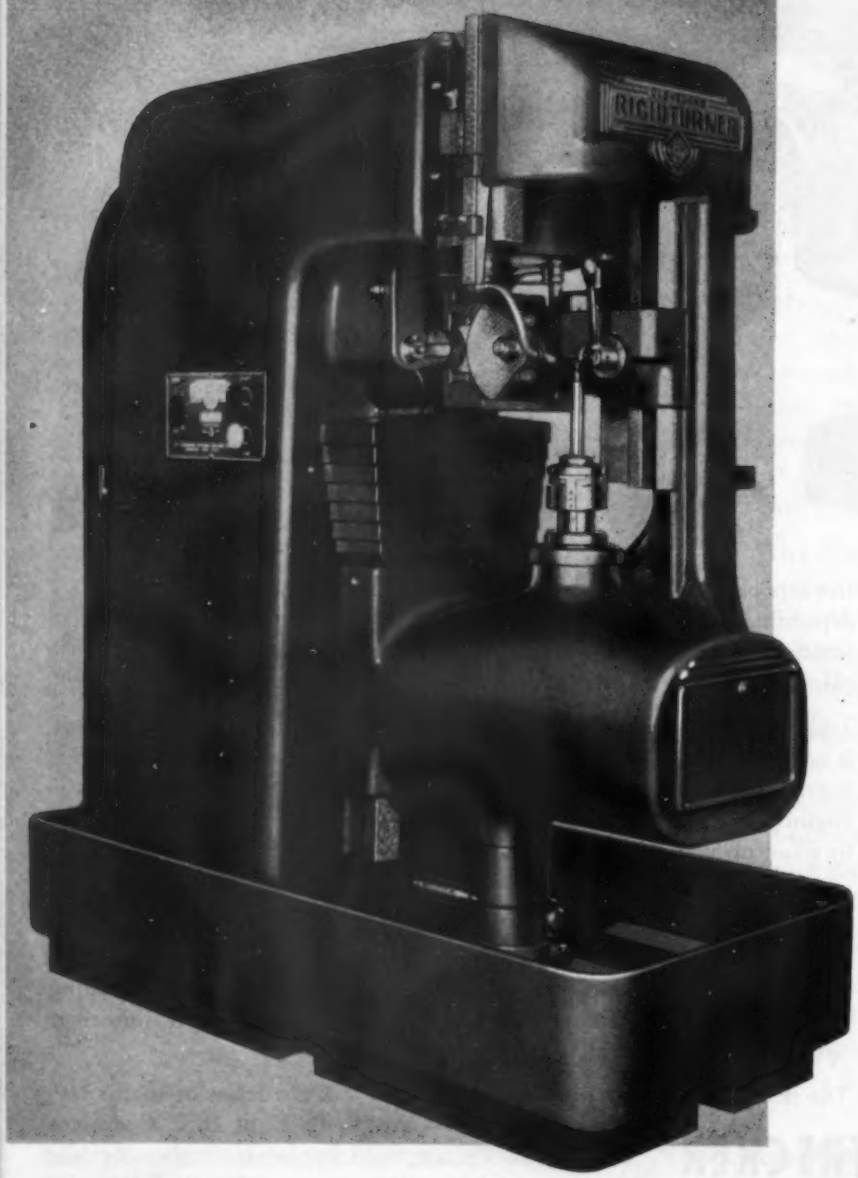
Back the Attack — **BUY MORE BONDS**

Milwaukee Machine Tools

FOR ACCURATE RAPID TURNING

of multiple diameters

THE RIGIDTURNER



● Here's a modern machine tool combining simplicity of operation and rapid production in turning multiple diameter work at lower costs.

The work advancing past the cutter rotated in variable timed relation produces different diameters. Rigidity is assured the disc type form cutter, mounted on the cutter arbor, by the outboard support.

The result is the faithful duplication of precision work—in less time—and at lower cost. Consult a Cleveland Hobbing Engineer on the economy of using a Rigidturner for turning your multiple diameter work.

This booklet gives complete information on how the Rigidturner works and how it can cut your costs on multiple diameter turning. Write for a copy today.

The CLEVELAND HOBBING MACHINE Company

General Offices:
1311 CHARDON ROAD
CLEVELAND 17, OHIO

Chicago Office:
624 S. MICHIGAN AVE.
CHICAGO 5, ILLINOIS

BUILDERS OF RIGIDHOBBERS AND RIGIDTURNERS

7 REASONS* WHY

Your best bet for AC Welding is a "Bumblebee"

with a *Stinger that Penetrates*

Every feature of design and construction, both inside and outside the sturdy case of the Wilson "Bumblebee", has been planned to give the utmost in efficient, dependable and economical service:

1. *Precise, Stepless Adjustment of Welding Current* to any value within NEMA range, provided by easy-turning crank.
2. *Efficient Ventilation* by motor-driven fan assures safe, dependable operation, even when welding with maximum current.
3. *Reduced Power Factor Charges* and relief for overloaded power lines is provided by built-in capacitors.
4. *Coils Protected Against Fire and Vermin* by mica and glass fabric insulation.
5. *Interchangeable Primary Terminals* permit easy, rapid change from low to high line voltage or vice versa.
6. *Output or Secondary Terminals Readily Accessible* by removing 4 screws which hold small insulating panel.
7. *High Visibility of Current Indicator* is assured by large, easily read calibrated scale located outside case.

These features are incorporated in every "Bumblebee" welder—either regular or all-weather model. "Bumblebee" welders are also performing a valuable service as a power source for automatic welding heads.

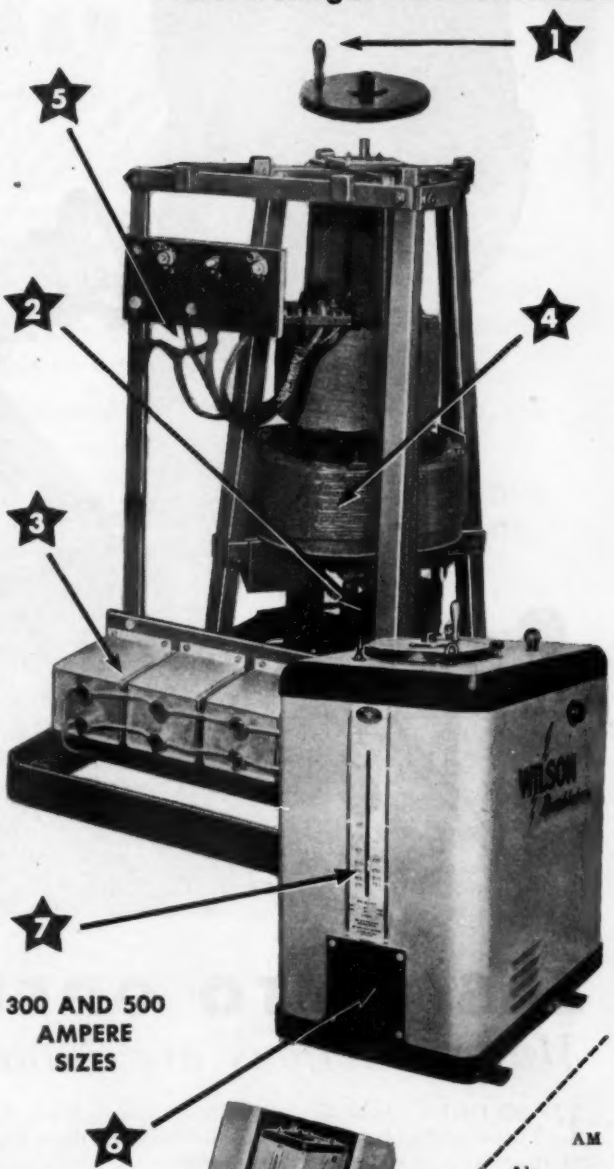
In addition, the "Bumblebee" offers all the advantages of AC welding:

- —Low Maintenance because of absence of moving parts
- —Low Power Costs because of high electrical efficiency
- —Faster Welding due to absence of arc blow and use of larger electrodes
- —Improved Quality of Welds

—at no greater first cost than other types of welding equipment.

Other AC welders in 100, 200, 750, 1000 ampere sizes.

Mail the coupon today for new catalog—or write to your nearest Airco office.



300 AND 500 AMPERE SIZES

BUY UNITED STATES WAR BONDS

AM
Air Reduction
60 E. 42nd Street
New York 17, N.Y.

Please send copy of your new "Bumblebee" Catalog to

Name.....

Firm.....

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General Offices: 60 East 42nd Street, New York 17, N. Y.
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EASIER TO OPERATE . . .

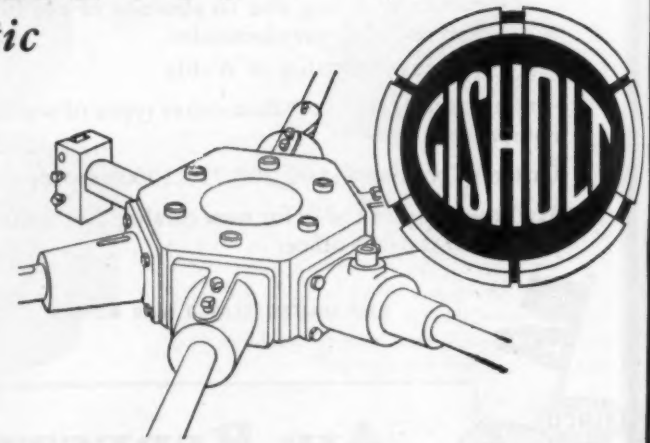
Many functions are automatic

EVERYTHING about these modern Gisholt Ram Type Turret Lathes has been simplified to make them easier to operate . . . to eliminate waste time . . . to reduce fatigue . . . to speed up production.

Such advantages as automatic spindle-braking, automatic indexing and clamping of the hexagon turret, and selective automatic speed changing relieve the operator of many motions and cut the lag in machining time.

We couldn't, in one short advertisement, begin to enumerate all of the time and effort-saving refinements which have been perfected through 60 years of building and using Gisholt Turret Lathes. But they are facts that you should know—for faster, easier production *now,* and in the years ahead.

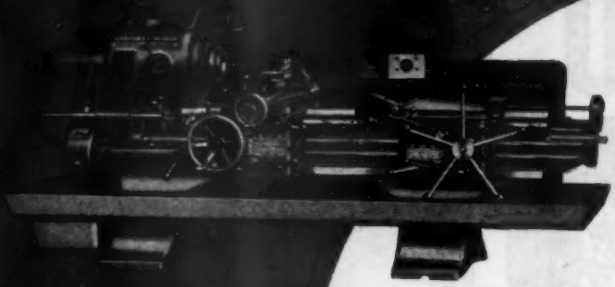
Ask a Gisholt engineer to tell you about them. Or write for descriptive literature.



GISHOLT MACHINE COMPANY
1201 East Washington Avenue • Madison 3, Wisconsin

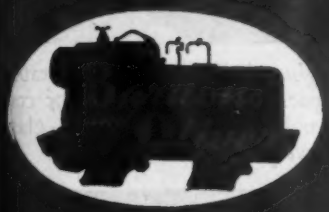
Look Ahead . . . Keep Ahead . . . With Gisholt Improvements in Metal Turning

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINE



HYDRAULIC COLLET CHUCK AND BAR FEED

Step Up Production



Easy and natural movements of the convenient control lever, in the operator's left-hand, opens the collet, feeds and grips the bar for the next cut. The work is done by a hydraulically actuated mechanism driven by a pump in the head.

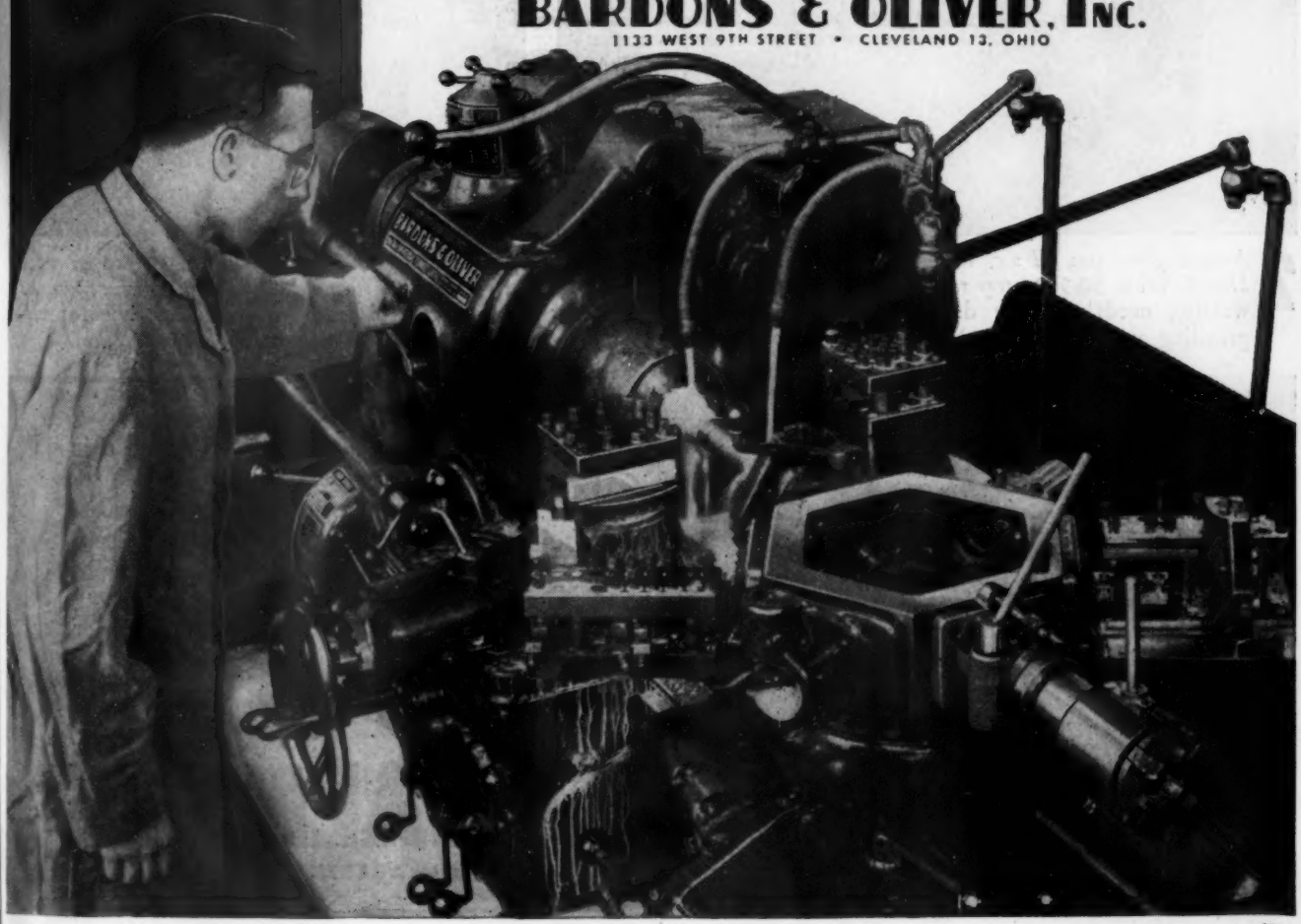
It means more parts produced at the end of the shift. Yet, the operator feels far less fatigued from his day's work.

This is another new and exclusive feature of the BARDONS & OLIVER NO. 21 SADDLE TYPE UNIVERSAL TURRET LATHE.

Write for catalog today.

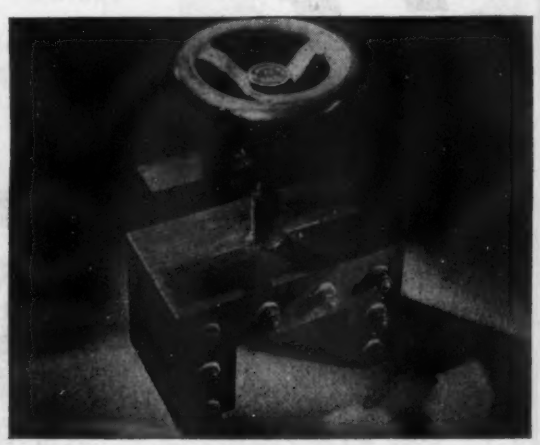
BARDONS & OLIVER, INC.

1133 WEST 9TH STREET • CLEVELAND 13, OHIO



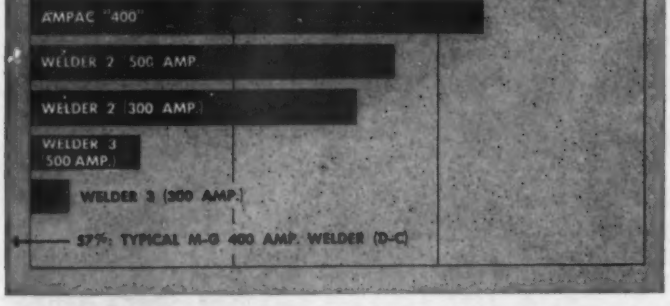
AMPAC "400" GIVES YOU IDEAL SIZE AND RANGE!

1 Top welder *engineering*, too, is incorporated into every Ampac. This compact reactor coil is efficient . . . cool-operating. Its spun-glass insulation is *flame-proof!*



2 Ampac gives you *all* a.c. welding advantages — including *no arc blow!* Wide 50-500 amp range provides capacity for *90%* of all welding needs! Simply designed and ruggedly constructed for gruelling wartime service. *Minimum* maintenance required!

3 Smooth one-inch movement of upper core covers entire welding range . . . in *seven turns* of control wheel. Result: less time for *adjustment* — more time for *production!*



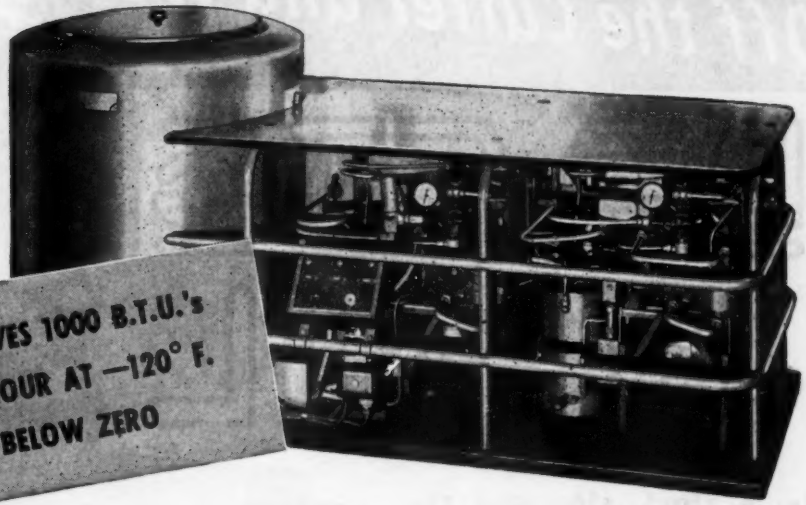
4 High welder efficiency means *decreased* power consumption — and therefore *lower power bills!* Compare Ampac's excellent rating against two largest selling a.c. welders and a typical d.c. unit. You *save* with Ampac! A 1678

GET THE FULL STORY on this great new welder from your nearby Ampac dealer or Allis-Chalmers district office. Learn about its exclusive patented circuit. Ask for bulletin B6302 . . . also B6241 on Ampac "200".

ALLIS-CHALMERS

MILWAUKEE, WISCONSIN

HOW CAN I USE THE NEW *Deepfreeze* PROCESS OF COLD TREATING IN *MY* PLANT?



Of course the specific answer to this question is entirely dependent upon the type of products being manufactured in your plant and your manufacturing process, but we can answer it in part by telling you briefly how the Deepfreeze Cold Treating Process is being used in other plants.

Your work might be similar. Take the following few examples for instance:

Manufacturers are using Deepfreeze Cold Treating as a supplement to heat treating to secure greater hardness and more uniformity of structure in machine parts.

Tool manufacturers and tool users are obtaining remarkable increases in tool life by cold treating high speed cutting tools in Deepfreeze Industrial Chilling Equipment. Increases in tool life of as much as 500% have been reported by many tool users.

Manufacturers of precision instruments and gauges are using the Deepfreeze Cold Treating Process to age products and stabilize dimensions. This quick-aging of steel by chilling eliminates costly material growth and warp by holding the finished sizes under all normal temperature changes and handling.

Aircraft manufacturers are using Deepfreeze Cold Treating to test all types of flying instruments and accessories in order to predetermine their reactions to the atmospheric conditions they will encounter in flight.

Manufacturers in general are using Deepfreeze Cold Treating in the assembly of parts. Chilling for shrink-fit assembly not only increases production but eliminates costly rejects because of distortion and scoring prevalent in other methods.

Space limits the number of applications that can be presented here, but you can secure the complete story on Deepfreeze Cold Treating as well as the answer to the question "How to Use Deepfreeze Cold Treating in Your Plant" by dropping us a line. Let us know the type of work at which you are now engaged and we will point out the possibilities and advantages of utilizing cold treating in its production. This information is offered to you without cost or obligation.

The information contained in this booklet will give you a complete account of cold treating with Deepfreeze Industrial Chilling Machines. Whether you are acquainted with the Deepfreeze process of cold treating or not, you will find that the material included will give you the latest facts on the cold treating of metals. Write today for your free copy.

...e's what others ...ve to say about ...ld treating with Deepfreeze

...ROMINENT MANUFACTURER OF ...LING CUTTERS says, "By cold treating cutters in a Deepfreeze machine at ...0° F. for two hours, we have increased cutter life from 7 to 24 hours ...grind."

...ROACH MANUFACTURER writes, "...r cold treating high speed burnishing broaches at —120° F. for three hours, ...crease of from 216 to 648 pieces ...grind was obtained."

...ANUFACTURER OF PRECISION ...GES states, "We have been able to ...imize expansion in precision gauges ...s by treating them in Deepfreeze ...strial Cold Treating Machines. This ...lization eliminates costly metal ...th and warping which formerly ...oyed accuracy."

...ANUFACTURER USING DEEPFREEZE ...SHRINK FITS comments, "The Deep... Cascade —120° F. Industrial ...g Machine saves us from $3000 ...00 per month over use of liquid ... assembling piston bushing."

...r More Proof of ...pfreeze Savings Get this ...REE Booklet

Prompt Delivery

...an do more than talk Deepfreeze...you ...t Deepfreeze now. If you are a producer ...ential wartime products and can qualify ...r government priority regulations, we ...promptly supply you with a Deepfreeze ...strial Chilling Machine. The sooner you ...your order, the quicker your production ...benefit.

Deepfreeze

TRADE MARK DEEPFREEZE REGISTERED UNITED STATES PATENT OFFICE

Industrial Chilling Equipment for Shrinking, Testing, Hardening and Stabilizing Metals

2327 DAVIS STREET,
NORTH CHICAGO, ILLINOIS

Division of Motor Products Corporation, Detroit, Michigan

He Never Has to Take His Eyes Off the Cutter and Work

DEVLIEG JIGMIL

Spindle start, stop and reverse—

Power vertical feed and rapid traverse movement—

Power horizontal feed and rapid traverse movement—

Power automatic table retraction and repositioning—

Power feed and rapid traverse to bar movement—

are all carried in a master switch on the spindle head — at the operator's finger tips.

Thus, the operator of the DeVlieg Jigmil can fix his vision on the cutter and work—never has to look at controls during operation.

The Jigmil is what a machine tool should be—a powerful and accurate extension of the operator's hand. The value in precision boring and milling is apparent.

It's a NEW Type Machine

Spacing Accuracy of a Jig Borer . . . Performance Qualities of a Milling Machine . . . Convenience and Flexibility of a Horizontal Boring Mill.

New speed of operation . . . New standards of excellence of bored holes . . . New accuracy in milling . . . Automatic table retraction and repositioning dependable within .0002".

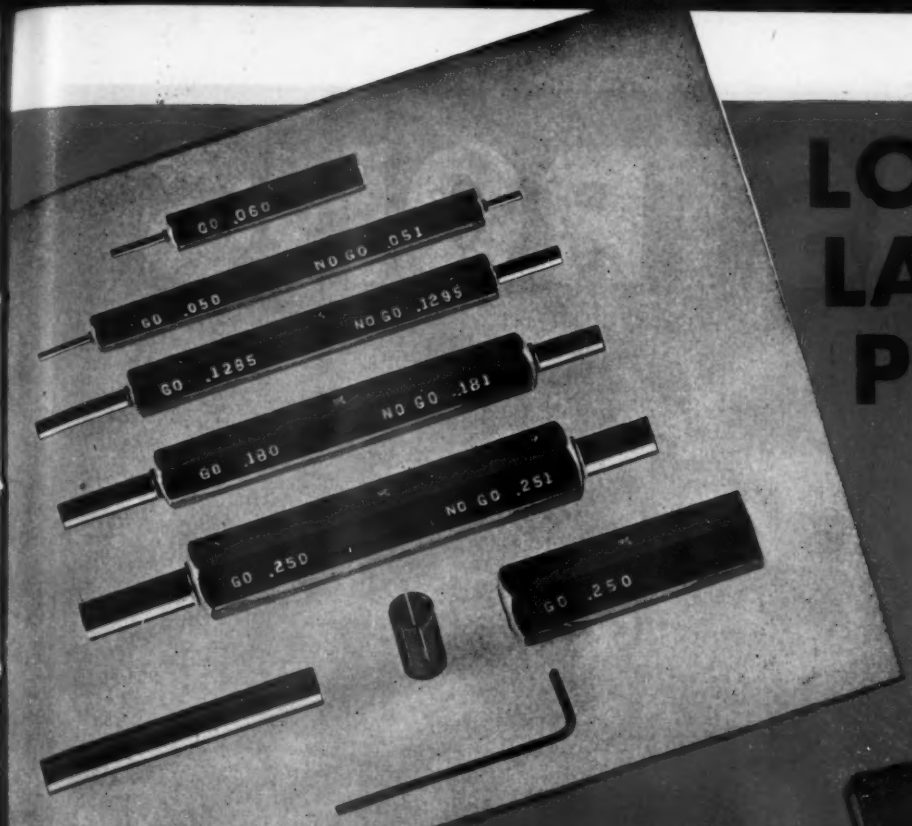
Many machines show 75% greater average daily productivity.

Write for Circular

DEVLIEG MACHINE TOOLS

DE VLIEG MACHINE COMPANY

450 FAIR AVENUE, FERNDALE 20, (DETROIT), MICHIGAN



WIRE TYPE PLUG GAGE SET No. 60
These gages provide an accurate means of measuring small holes and also standards for checking twist drills in sizes from 1 to 60. (.228" to .040 dia.)
PRICE $325.00

LONGER LASTING PRECISION

On Small Hole Measurements

Van Keuren WIRE TYPE PLUG GAGES

Taper insert plug gages in small sizes cost a lot per unit of usable surface. Van Keuren Wire Type Plug Gages give longer lasting precision because the entire 2" length of the gaging unit can be used. Split bushings and headless set screws clamp the wire units securely in the handle. When a unit becomes worn it may be ground off and a new section moved out.

All Van Keuren Wire Type Plug Gages are made to a standard tolerance of +.00005" —.00000" on Go units; ±.000025" on No Go units. Closer or wider tolerances can be supplied if desired.

Van Keuren Wire Type Plug Gages are but one of the many types of measuring equipment in which we specialize. Write for Catalog 32 describing our complete line. More than a catalog! . . . It is a valuable handbook of precision measuring methods.

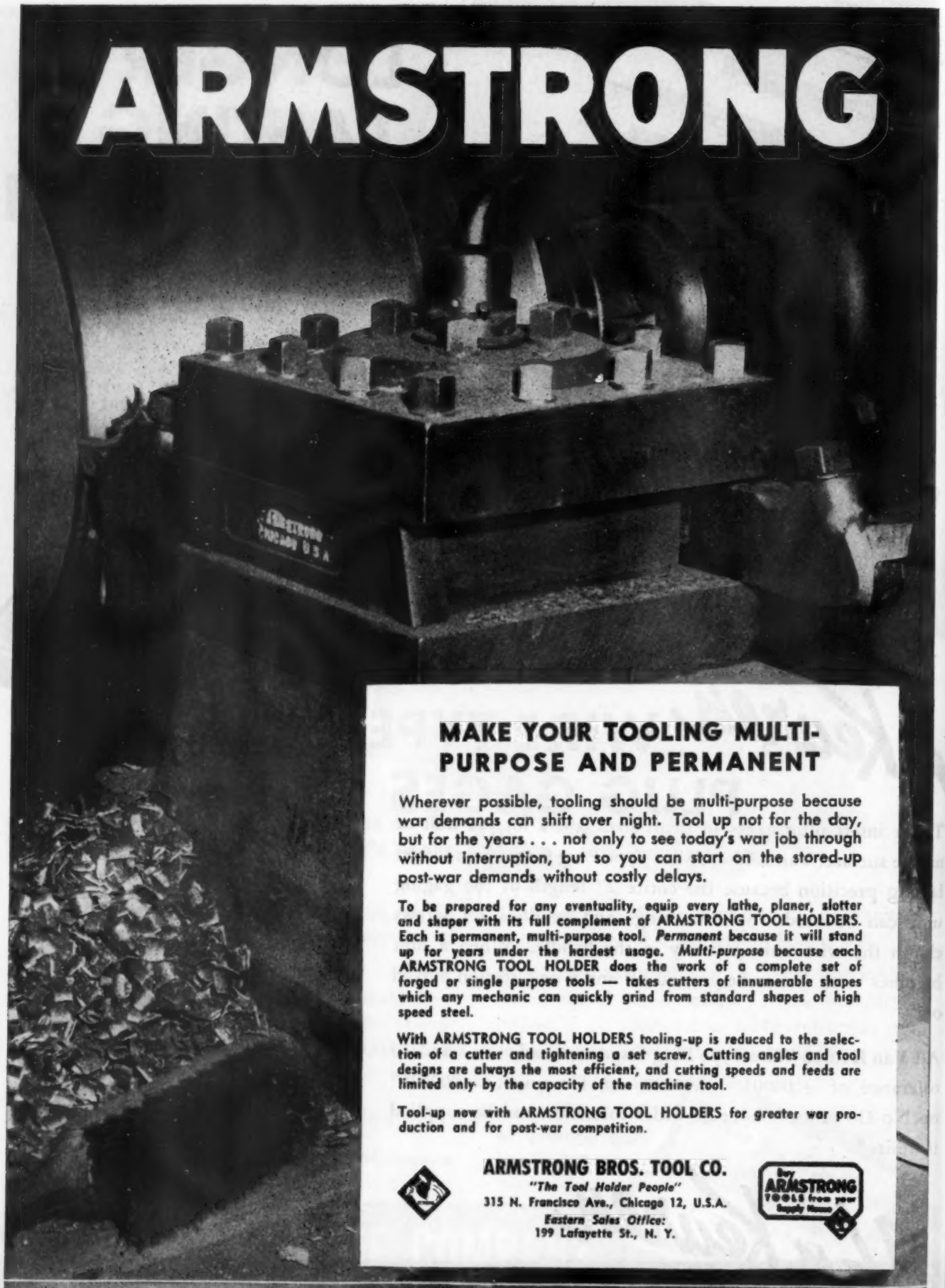
Van Keuren

25th YEAR

CO., 176 WALTHAM ST., WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles

ARMSTRONG



MAKE YOUR TOOLING MULTI-PURPOSE AND PERMANENT

Wherever possible, tooling should be multi-purpose because war demands can shift over night. Tool up not for the day, but for the years . . . not only to see today's war job through without interruption, but so you can start on the stored-up post-war demands without costly delays.

To be prepared for any eventuality, equip every lathe, planer, slotter and shaper with its full complement of ARMSTRONG TOOL HOLDERS. Each is permanent, multi-purpose tool. *Permanent* because it will stand up for years under the hardest usage. *Multi-purpose* because each ARMSTRONG TOOL HOLDER does the work of a complete set of forged or single purpose tools — takes cutters of innumerable shapes which any mechanic can quickly grind from standard shapes of high speed steel.

With ARMSTRONG TOOL HOLDERS tooling-up is reduced to the selection of a cutter and tightening a set screw. Cutting angles and tool designs are always the most efficient, and cutting speeds and feeds are limited only by the capacity of the machine tool.

Tool-up now with ARMSTRONG TOOL HOLDERS for greater war production and for post-war competition.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
315 N. Francisco Ave., Chicago 12, U.S.A.
Eastern Sales Office:
199 Lafayette St., N. Y.

Buy ARMSTRONG TOOLS from your Supply House

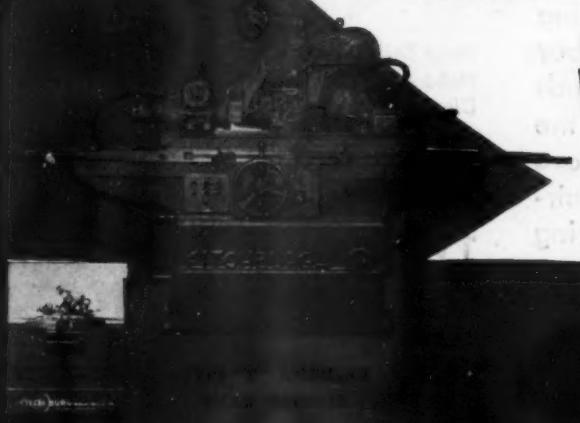
ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

FOR GENERAL PURPOSE PLAIN CYLINDRICAL GRINDING . . . FITCHBURG *shows the way to increase production and cut costs*

6-inch Type "B"—The Fitchburg Type "B" 6-inch automatic precision grinder features new engineering principles that result in more economical and faster production of plain cylindrical parts. Made with 18" and 32" maximum capacity between centers.

10-inch Type "B"—The Fitchburg Type "B" 10-inch plain cylindrical automatic precision grinder also incorporates engineering features that result in more economical and increased work production, greater accuracy, and finer finish. Made with 18", 48" and 72" maximum capacity between centers.

Type "C" Adjustable Angular Head Grinder—The Fitchburg Type "C" Angular Head grinding machine is a single application of the Fitchburg Standard Bowgage Wheelhead Unit. It is designed to handle a wide range and a number of types of jobs. The Bowgage Unit is mounted so that it may be located to grind 0 degrees up to a 45-degree included angle. Prompt deliveries can be made. Mail coupon today.



Please mail the catalog checked.

6" Type B ☐ 10" Type B ☐ Angular Head ☐

NAME _____ TITLE _____

COMPANY _____

STREET _____ STATE _____

CITY _____ A.M.

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U.S.A.

Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

EVERY DEMAND FOR SAVINGS IS BEING MET . . .

. . . in *"The Tools You Buy Again"*

Small tools — at the business ends of machines working to capacity — must be capable of making time, labor and material savings in order that production demands be met. UNION TOOLS are meeting such demands in the countless plants turning out war materiel. They are saving time by faster cutting — saving labor by requiring less resharpening — conserving material by assuring accuracy and minimizing spoilage.

The ability of UNION TOOLS to make savings is traceable to an in-built fineness of quality which in turn is the result of UNION'S long, specialized experience in small tool development.

For the sake of savings, it will pay you to standardize on UNION.

Twist Drills — Milling Cutters — Reamers — Hobs — Slitting Saws — End Mills — Taps — Dies — Screw Plates — Profile Cutters.

•

UNION
TWIST DRILL COMPANY
Athol, Mass.

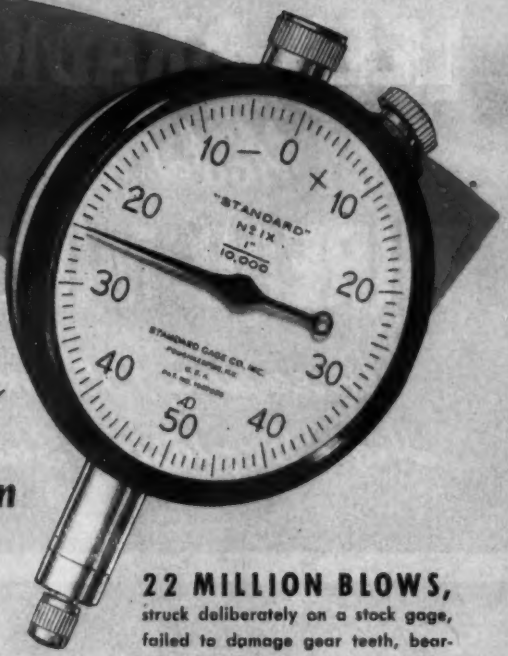
STORES New York Store: 61 Reade St.; Los Angeles Store: 524 East Fourth St.; Chicago Store: 11 So. Clinton St.; Seattle Store: 568 First Ave., So.; San Francisco Store: 121 Second St.; Detroit Store: 6540 Antoine St.

MANUFACTURING DIVISIONS
S. W. Card Mfg. Co., Div.; Mansfield, Mass.
Butterfield Division, Derby Line, Vt., and Rock Island, Quebec

UNION

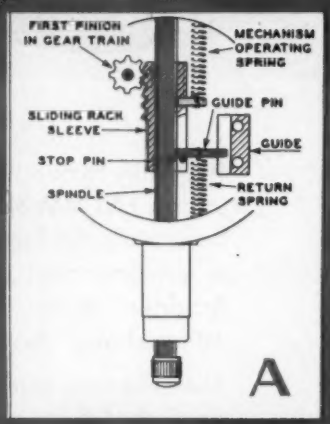
STANDARD

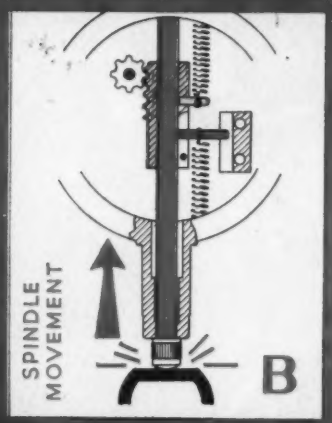
SHOCKPROOF *Dial Indicators*

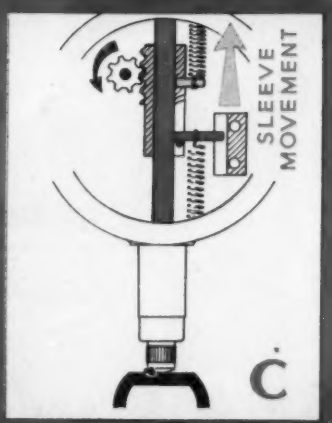


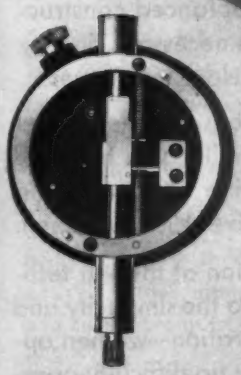
Here's How The SHOCKPROOF Action Protects the Precision Mechanism

22 MILLION BLOWS, struck deliberately on a stock gage, failed to damage gear teeth, bearings or spindle, or impair the instrument's accuracy.









Rear view of SHOCKPROOF Dial Indicator, cover removed, showing "Free Wheeling" mechanism.

A — Rest Position

B — Sudden blow or contact by work piece raises spindle. For an instant guide pin moves away from contact with stop pin. This allows mechanism operating spring to raise the rack sleeve which is slidable on the spindle.

C — Stop pin and guide pin resume contact after the mechanism operating spring has actuated the gearing. Relative position of spindle and rack sleeve is restored.

In actual use only the more sudden shocks against the contact point jar the spindle ahead of the rack sleeve. For normally applied contacts the sleeve and spindle move together as a unit. In any case the force on the mechanism is never any greater than the pull of the spring.

WRITE FOR COMPLETE CATALOG

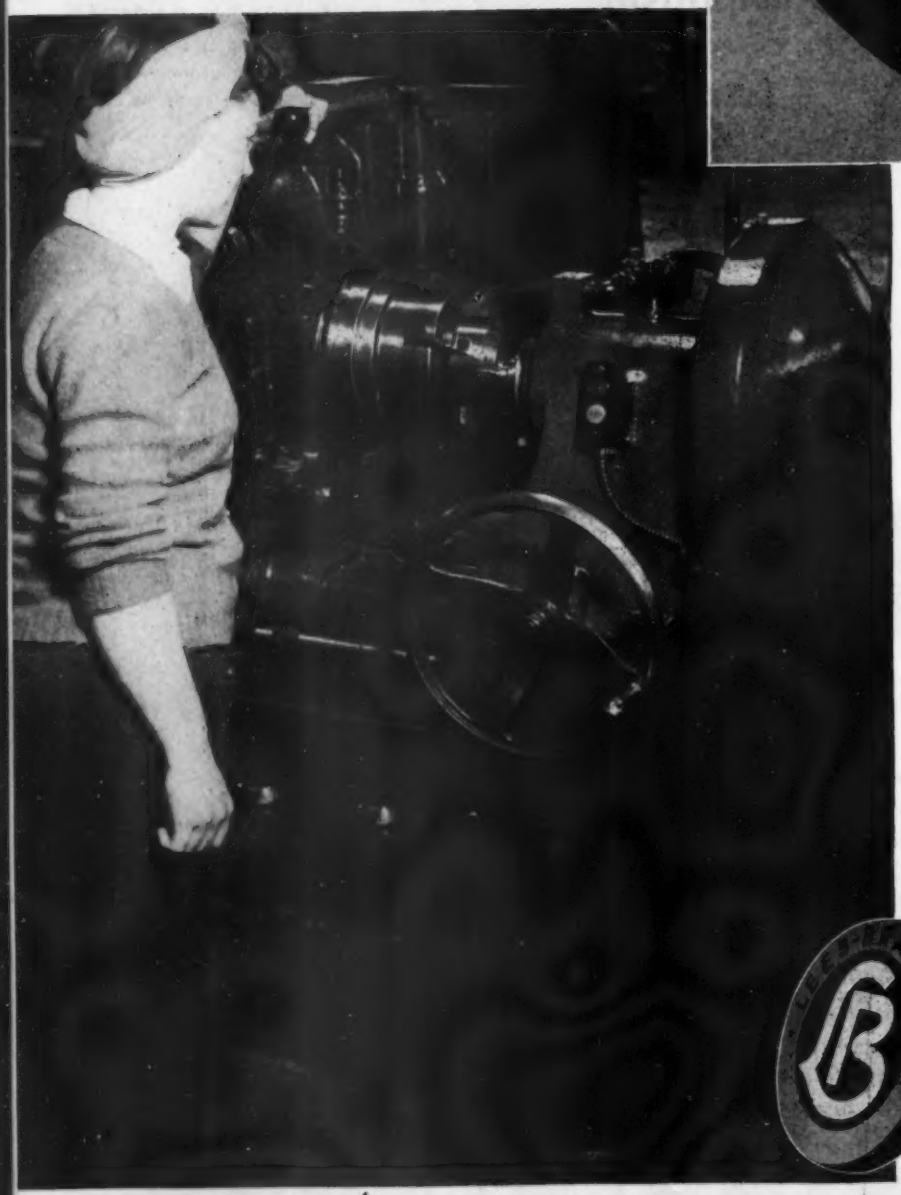
STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

LEES-BRADNER

Model 40

THREAD MILLER

threading 155mm High Explosive Shells



● Ability to handle the threading on 155 MM Shell quickly—accurately—in large quantities is demonstrated by the Lees-Bradner Model 40 Thread Miller shown above.

The simplicity and ease of operation of the machine assures maximum production. The sturdy well balanced construction provides necessary rigidity to maintain close tolerances.

Thus in the Lees-Bradner Model 40 Thread Miller you have an ideal machine for threading high explosive 155 MM Shell.

The illustration at the left testifies further to the simplicity and ease of operation—women operators have no difficulty operating this machine.

For further details *why not call an LB Engineer*. He can help you solve your precision threading problems.

The LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.

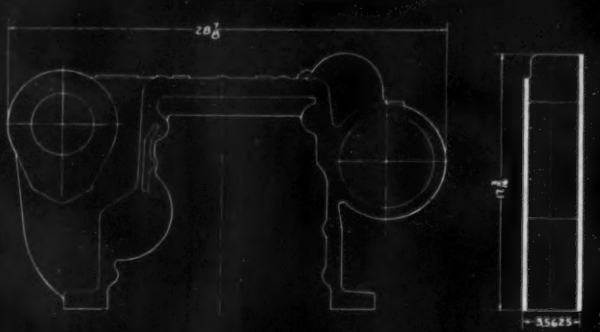
THOMPSON *grinding Diesel Engine Timing Gear Housings from the rough*

● On the work shown this Thompson Type "C" 30"x36"x120" Grinder is grinding 1/8" stock off each side of the housing from the rough — eliminating milling operation entirely on this job — see heavy lines at right of blueprint.

Not only is this method faster — saving 11 minutes per piece, floor to floor time — but is more accurate and eliminates distortion. It also reduces labor costs and substantially increases production.

This is a typical example of the savings that are possible on many jobs by taking full advantage of the superior qualities of Thompson Grinders.

Consult a Thompson Engineer on your work. Perhaps you can save costly milling or planing operations by the right application of a Thompson Grinder.



THE **Thompson** GRINDER CO.

SPRINGFIELD, OHIO

THIS MOTOR PUSHES A "RIVER"

Surface condensers for power generating stations require the pumping of literally "rivers" of water. 40,000 gallons per minute is a lot of water, yet that is the capacity of this vertical, propeller-type circulating pump—a type now being used by a number of large utility companies.

To push that much water around takes plenty of power, and this specially designed Westinghouse motor delivers the 350 hp punch necessary to do the job.

You'll probably never need a motor to "push a river"—but the same kind of engineering skill that goes into such specialized motor jobs is back of every Westinghouse motor you buy.

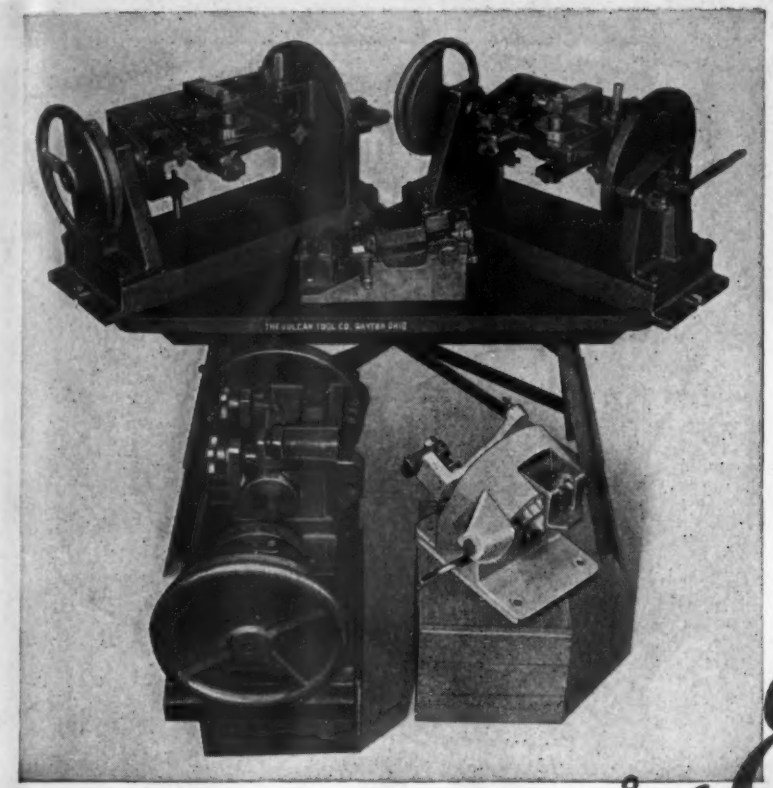
This ready-to-use experience is available to you for wartime needs—or in planning for postwar conversion. It can help you solve any drive problem quickly—with a motor exactly fitted to the job. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

J-21300

This is only one of the many Westinghouse general-purpose motors available in standard and special enclosures. Features include choice of sealed-sleeve or ball bearings; Tuffernell insulation; dynamically balanced rotor; rigid one-piece frame; die-cast rotor; radio-frequency tested insulation.

Westinghouse motors

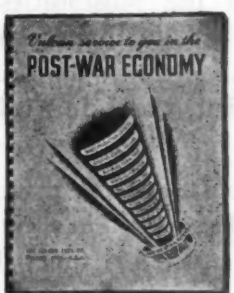
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE



Various Indexing Type Drill Jigs for one-piece crankshaft, twin-bank aircraft engines.

VULCAN *Designing Experience* IS YOURS

Vulcan engineers have designed plant layouts, tools, gauges and special machinery through one boom, one depression and two wars, and in widely varied fields of industry. Only such a wealth of broad experience could have enabled them to earn the high praise for ingenuity and precision recently accorded them by many of the nation's most exacting production heads. Now is the time to acquaint yourself with the service they can render in your reconversion.



Ask for the brochure illustrated. It will acquaint you with Vulcan's experience, facilities and services.

The VULCAN TOOL *Co.*

213 NORTH BECKEL STREET DAYTON 3 OHIO

ENGINEERING • DESIGNING • BUILDING • GAUGES • TOOLS • DIES • JIGS • SPECIAL MACHINERY

THERE ARE PLACES

For instance:

FIRTHITE *removes* 730 pounds of gray-iron casting metal per hour instead of 180 pounds;

drills a gun barrel in 23 minutes instead of 1 hour;

enables milling-cutters to run at 1,000 feet per minute instead of 100 feet with previous materials.

Firth-Sterling, long specialists in making steels for shop tooling, early recognized the possibilities of carbides as a means of extending the improvement in shop practice brought about by the super high-speed steel—CIRCLE C. **But, there is a place for both . . .**

Where the highest speeds are obtainable or materials are hardest, FIRTHITE is the "last word" in a cutting material. It is used at speeds up to ten times those possible with high-speed steels.

Where speeds above average are permissible or

Firth-Sterling

STEEL COMPANY

MAKERS OF HIGH-SPEED STEELS, TOOL AND DIE STEELS, AND SINTERED CARBIDES

FOR BOTH . . . .

materials are "on the hard side," CIRCLE C will cut *at least* 25% faster than ordinary grades of high-speed steel.

FIRTHITE is available in eight standard grades in the form of tips or blanks, tipped tools, and wear parts. CIRCLE C is supplied in the form of toolholder bits (ready for use), and bars in all standard sizes.

Send for descriptive literature on these remarkable materials. Both are typical of the Firth-Sterling specialties that, for nearly 50 years, have been the key to greater production wherever metal is fabricated.

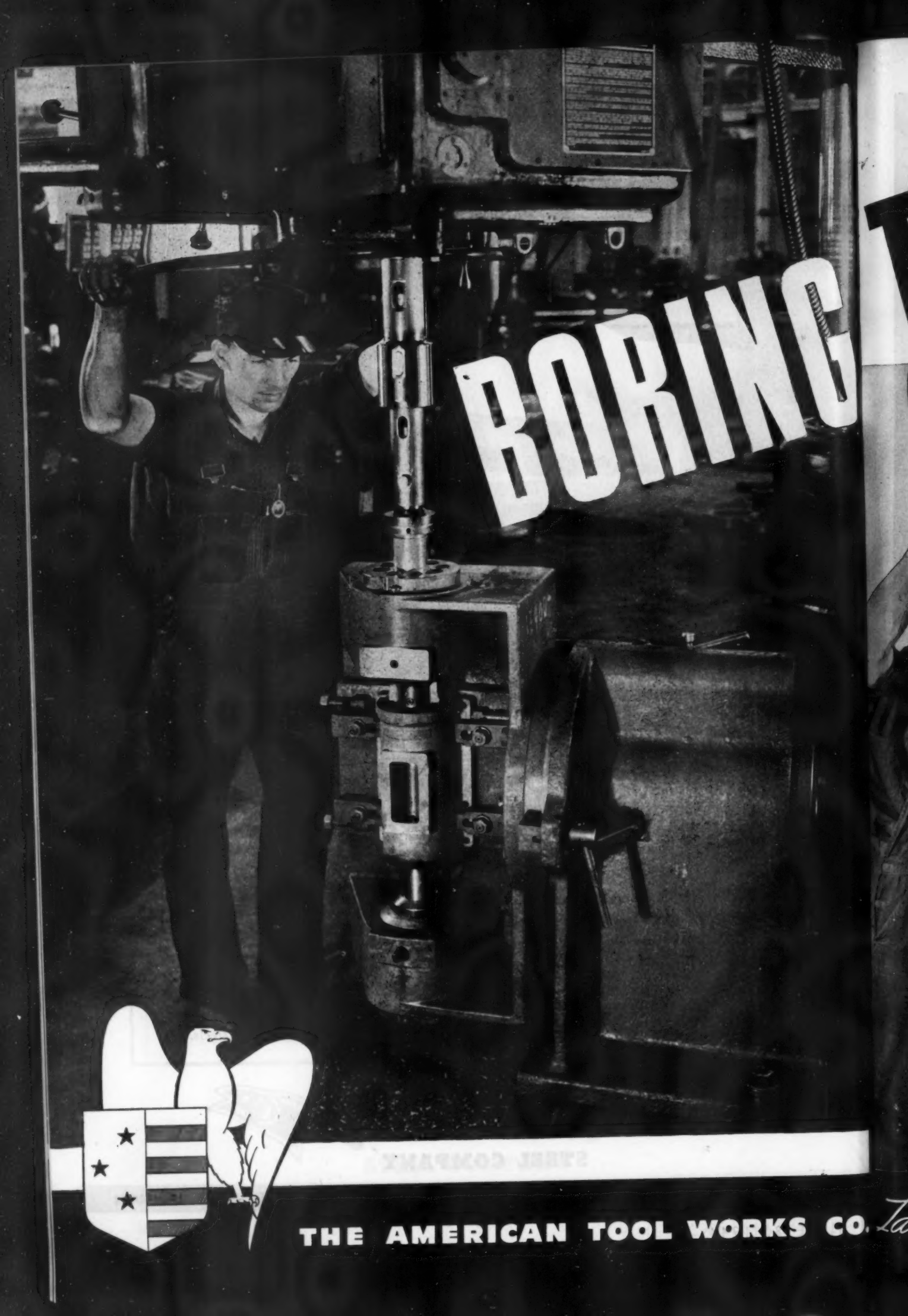
For instance:

CIRCLE C *machines* hard die blocks in 28 hours instead of 42 hours . . . doubling production between grinds—versus regular high-speed steel;

turns two to ten times more pieces of heat-treated alloy steel between grinds than other high-speed steels.

Firth-Sterling
STEEL COMPANY

ARMY E NAVY



THE AMERICAN TOOL WORKS CO.

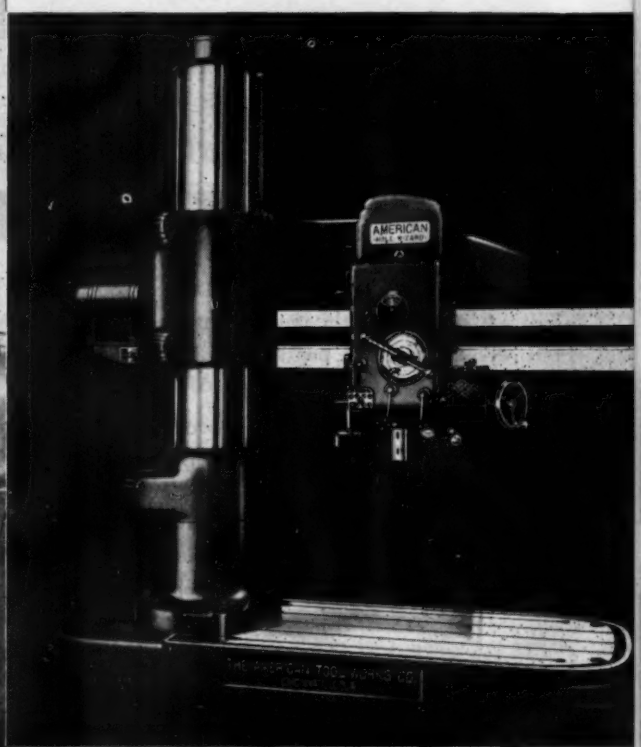
TECHNIQUE...

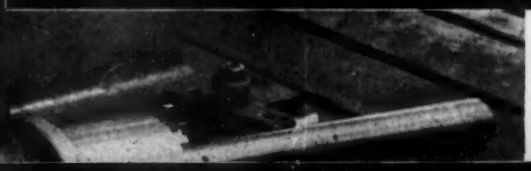
"American" Hole Wizard Radials are excellent boring machines.

These illustrations show the "American" Hole Wizard Radial boring 40 mm anti-aircraft gun worm housings through a two station jig mounted on an indexing trunnion stand.

The use of indexing trunnion stands brings the work to a comfortable working height for the operator which seldom is the case when stationary, base mounted jigs are employed, thus conserving the operator's energy and prolonging his efficiency.

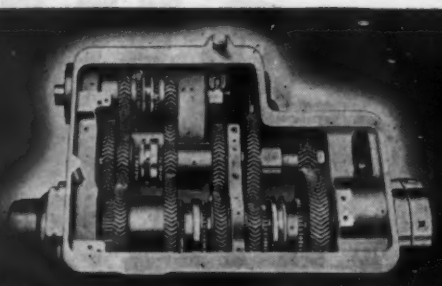
For additional advantages offered by the combination of "American" Hole Wizard Radials and indexing trunnion stands, write for Bulletin No. 458.





CO. *Lathes and Radial Drills* **Cincinnati, Ohio U.S.A.**

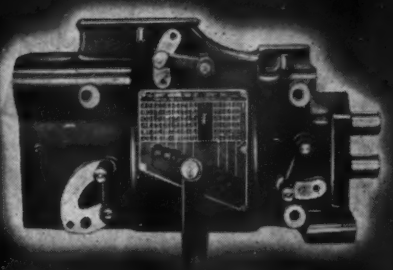
RIGID BED CONSTRUCTION



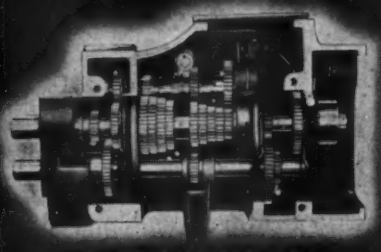
CONTINUOUS TOOTH 30° HELIX HERRINGBONE GEARED HEAD

Sidney

40TH ANNIVERSARY



FRONT VIEW OF GEAR BOX



REAR VIEW OF GEAR BOX

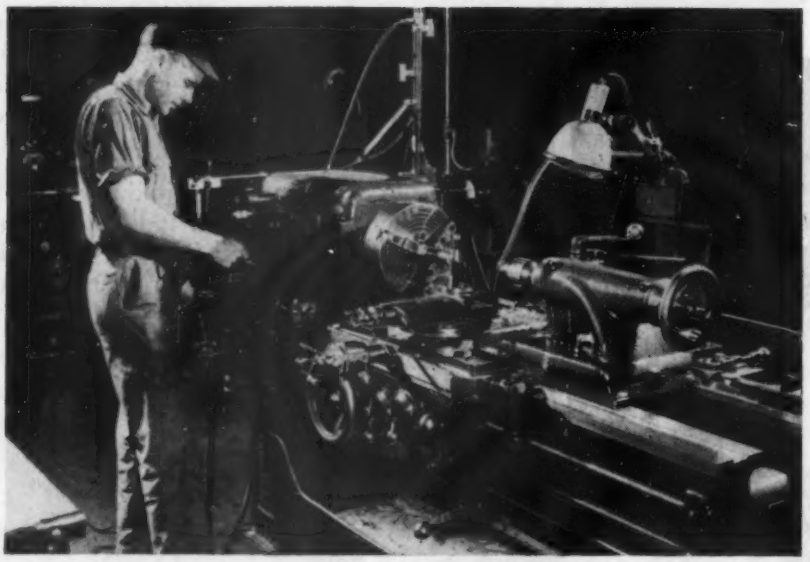
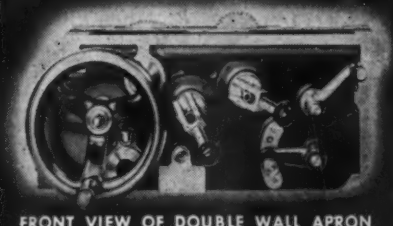
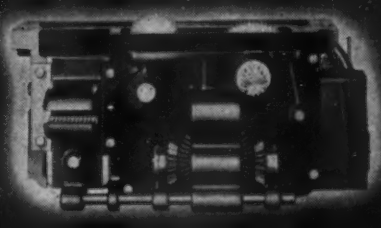


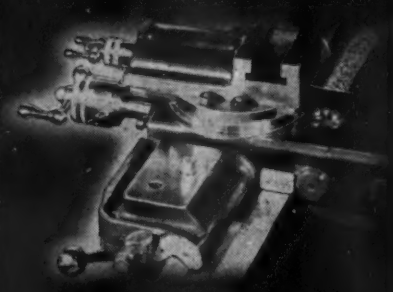
Photo courtesy of Douglas Aircraft Company, Inc.



FRONT VIEW OF DOUBLE WALL APRON



REAR VIEW OF DOUBLE WALL APRON



SIDNEY COMPOUND REST

Winged Victory demands speed and precision

SIDNEY LATHES

● It would be difficult to find work requiring closer tolerances than airplane parts and the vast number of Sidney Lathes used by manufacturers of aircraft parts and in aircraft plants is indicative of the accuracy and dependability of Sidney Lathes for precision work.

The rigidity of Sidney Lathe bed with its four walls and cross girts at twelve inch intervals—the continuous tooth Herringbone Geared Headstock—the husky controls located centrally at the operator's fingertips provide all the essentials of strength—smooth flowing power—and ease of operation—to produce close tolerance work—easily—quickly. If your work requires aircraft precision put it on a Sidney Lathe.

Bulletins on all sizes available.

The SIDNEY MACHINE TOOL Company

Builders of Precision Machinery

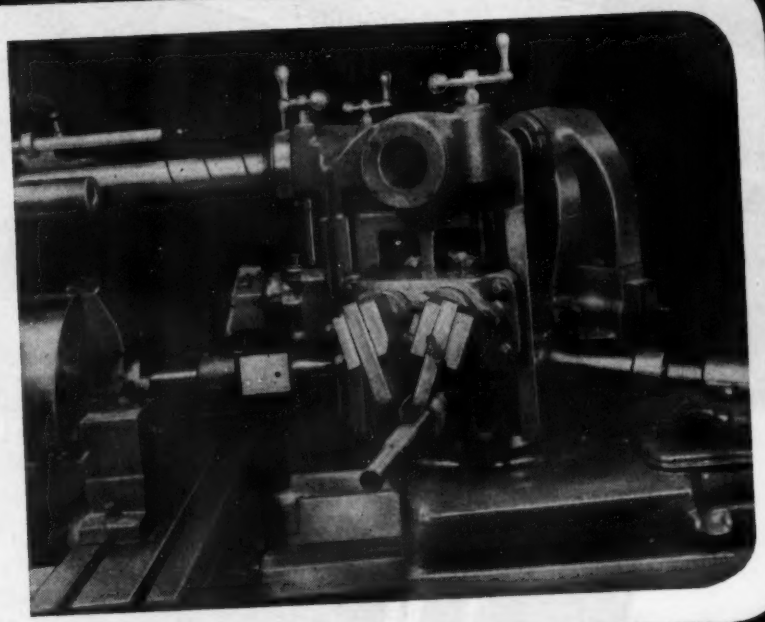
SIDNEY ESTABLISHED 1904 OHIO

PRESENT P&J MACHINES

have set-up possibilities...for future needs because they can be* RE-TOOLED *to advantage.....

PRODUCING BEARING CAGES YESTERDAY

At the time this set up on a 5D Single Spindle Powerflex was being used in production, machining operations were being performed which resulted in a production of 18 bearing cages per 51 minute hour. Operations included rough and finish boring, facing, turning also chamfering, reaming and turning to size.



BUT...*different parts tomorrow*

To change over from pre-war parts to post-war products is merely a matter of converting present P&J machines to new use by RE-TOOLING. Past production performance on one job can easily be equalled or bettered on entirely new work, machines remaining essentially the same.

Your P&J Chucking equipment has already demonstrated its time- and cost-cutting advantages. Now you can project the utility of these machines into the future and derive still further returns from your original investment. At a fraction of the cost of a new machine, you can RE-TOOL existing P&J equipment for post-war production needs. Let our engineers study your problems and offer suggestions for handling it. We have the "know-how" and the complete facilities for rendering a valuable RE-TOOLING SERVICE. *Investigate.*

POTTER & JOHNSTON MACHINE CO., *Pawtucket, R. I.*

P&J Rebuilding Service

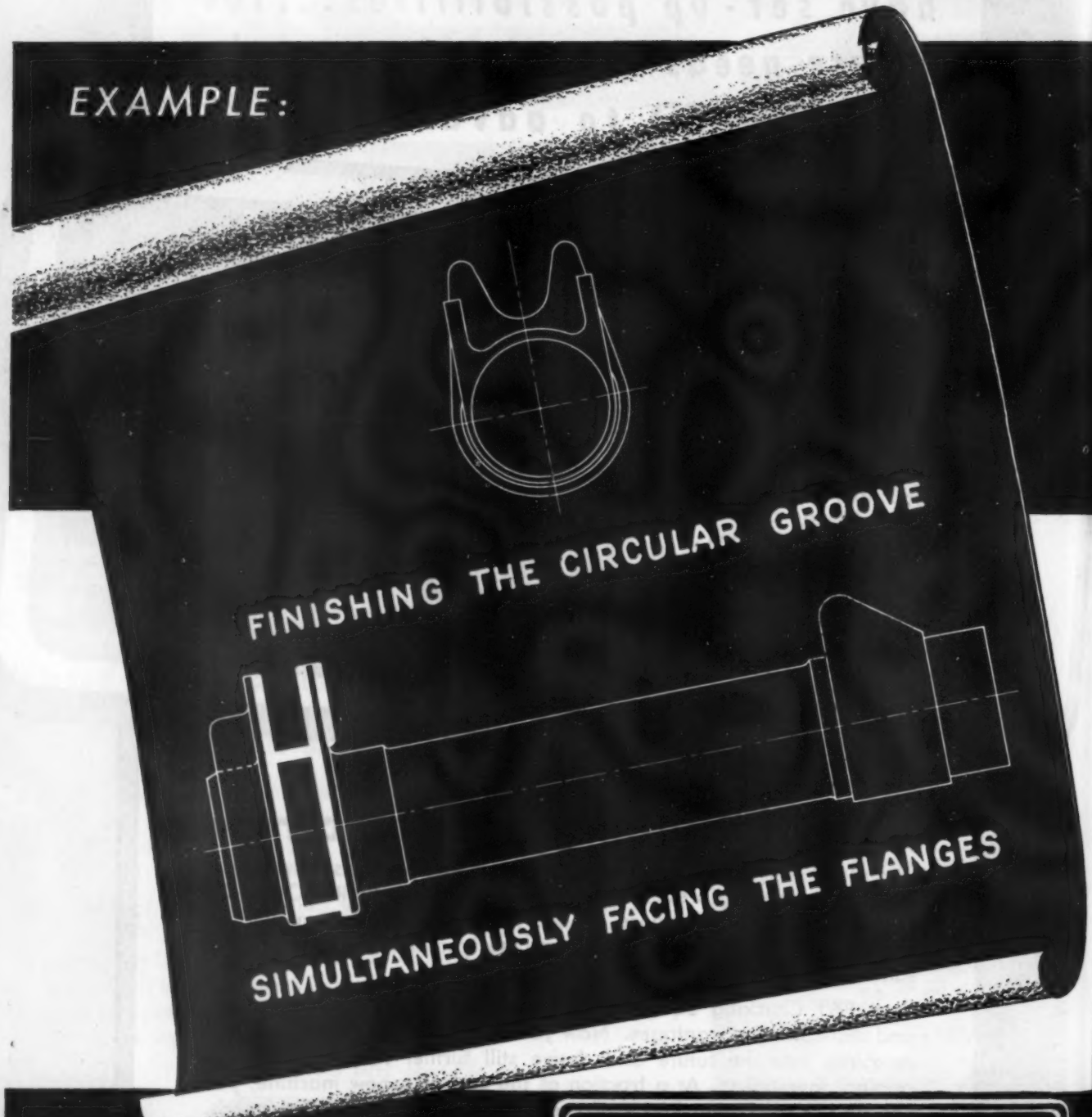
P&J is prepared and equipped to rebuild owners' present P&J Automatics to original productivity and accuracy. Re-tooling can also be handled while equipment is in our shop for rebuilding.

For the sake of VICTORY and PEACE BUY BONDS!

If MANPOWER

SOLVE IT WITH SPECIAL

EXAMPLE:



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Fast production is everyone's problem—now, and tomorrow. But the Cross idea in designing special machinery is an idea that solves *manpower* problems, too, by creating machines that perform one or more metal-working operations automatically at the push of a button.

There are 35 detailed case histories similar to this one in the new Cross Catalog No. 240. If you have a production problem or a *manpower* problem, the solution may be yours for the asking. Just write The Cross Company, Detroit 7, Michigan, Department 41.

Special Machines •

S-10

for automatically performing any one or a combination of metal cutting operations

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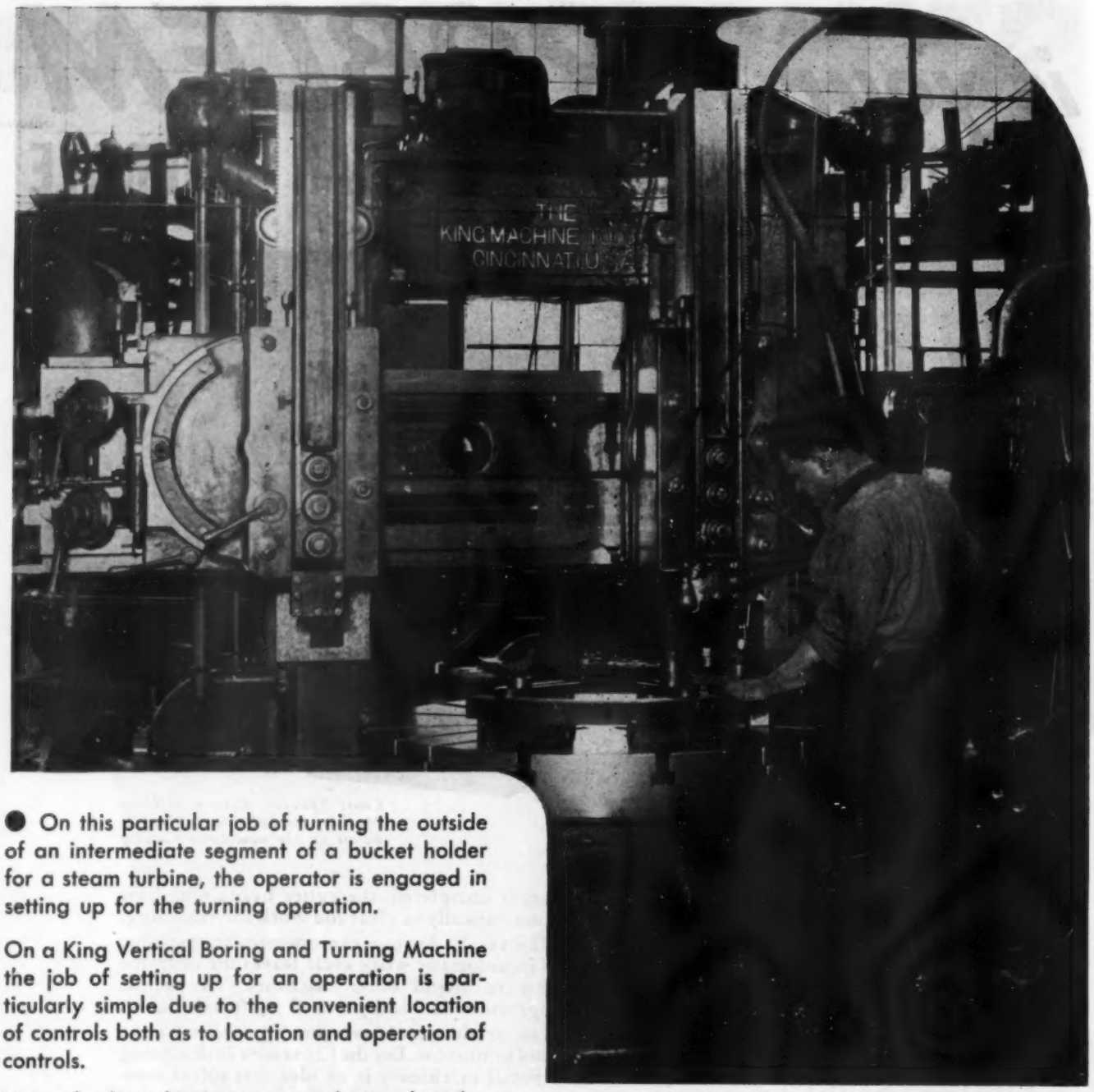

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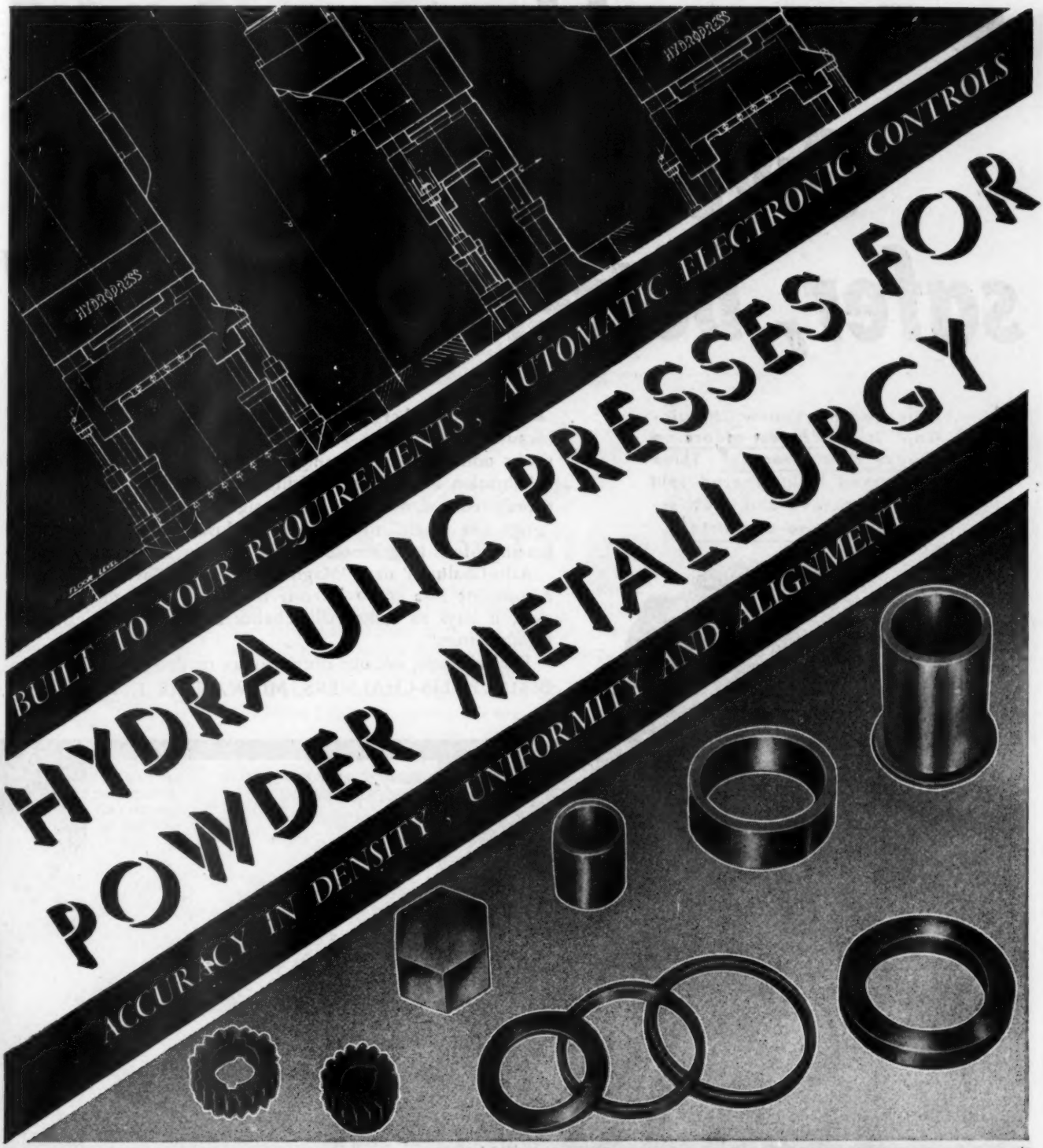
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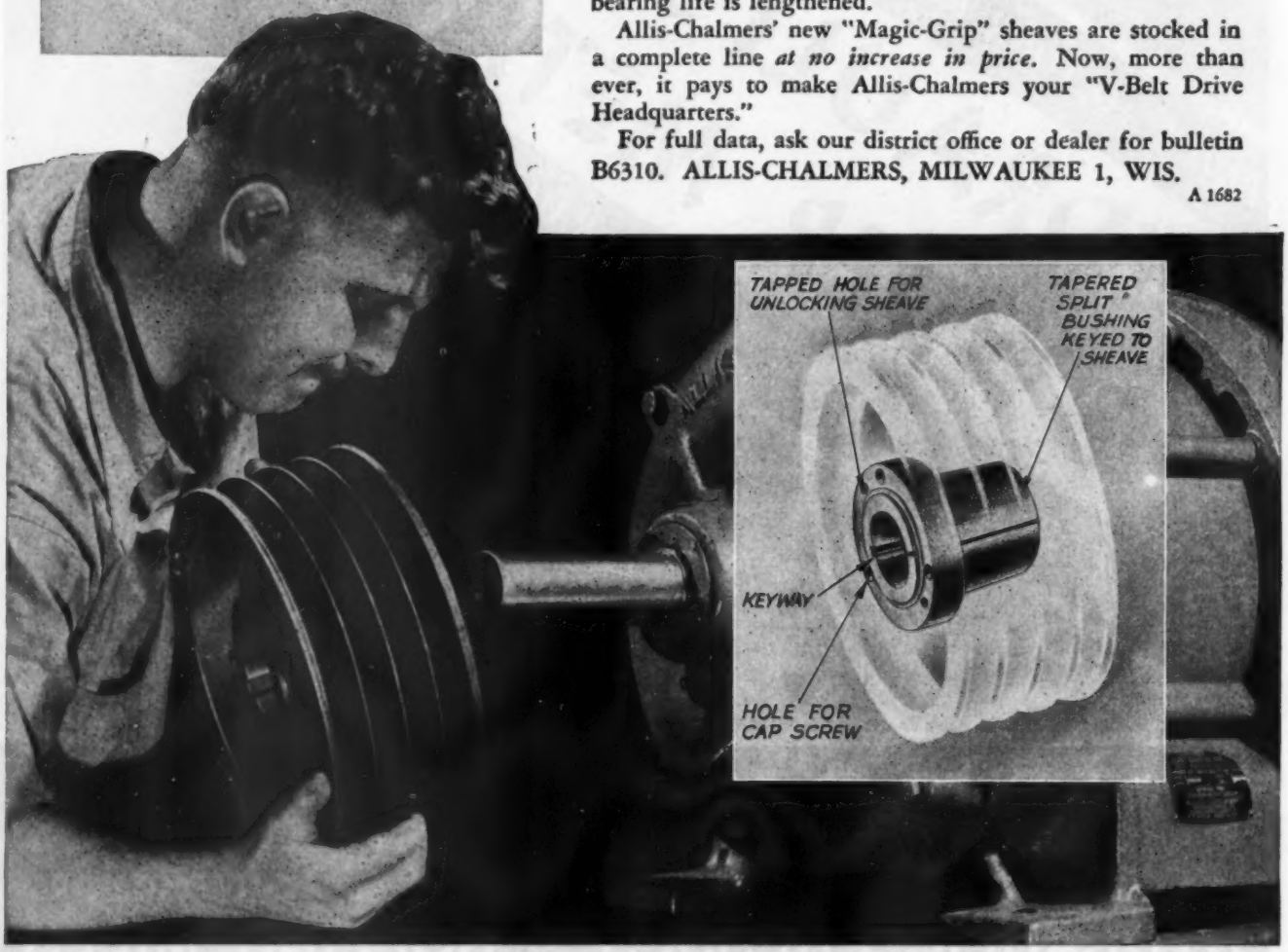

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THE HANSON WHITNEY MACHINE CO.

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Union Pacific's "City of Salina" was delivered in February, 1934

Union Pacific's "City of Portland" — *Baltimore & Ohio's "Anne Rutledge"* — *New Haven's "Comet"* — *Union Pacific's "City of Los Angeles" and "City of San Francisco"* — *Union Pacific's "City of Denver" (2 trains)*

Union Pacific's "City of Los Angeles" — *Missouri Pacific's "Eagle"*

Kansas City Southern's "Southern Belle" — *Union Pacific's "City of San Francisco"*

The first streamliner was the beginning of an evolution. Through the skillful use of Alcoa Aluminum, train designers have added greatly to the comfort, roominess and luxuriousness of modern streamliners, yet have kept these trains light in weight.

The American railroads, who have handled gigantic war problems so admirably, are well aware of the future transportation needs. Continuing the trend so firmly established before the war, builders of tomorrow's trains will find Alcoa Aluminum a material of ever-increasing usefulness, and Alcoa engineers better equipped than ever to serve them. ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA ALUMINUM

● This 1944 edition is a 134 page, cloth-bound book containing 163 illustrations. It is equally valuable to the planer operator and the man responsible for obtaining high production at low cost.

If you do not own the 1940 edition you owe it to yourself and your company to buy a copy today and learn planing the Hypro Way.

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The drawing above "takes the lid off" to let you see the complex mechanism that must be handled in a traveling crane . . . and the picture at right shows how W·A·B Controls help to solve the problem.

All friction clutches on this crane are governed with air. W·A·B pressure-adjusting valves control the clutches on both main drums, on the slewing drive, and on the travel, permitting smooth, easy engagement, that eliminates harmful shocks. Forward and backward travel are initiated by the forward or backward movement of the proper handle. Since a finger-touch is all that is necessary to move the valves, operator fatigue is lessened.

In your post-war planning, investigate the advantages of W·A·B Control Systems for improving your products, and your shop production. A whole series or cycle of operation can be controlled by movement of a single handle, interlocks prevent mistakes, and the force delivered can be anything from ounces to a ton. W·A·B Controls are now serving in dozens of applications . . . and they can undoubtedly do a job for you.

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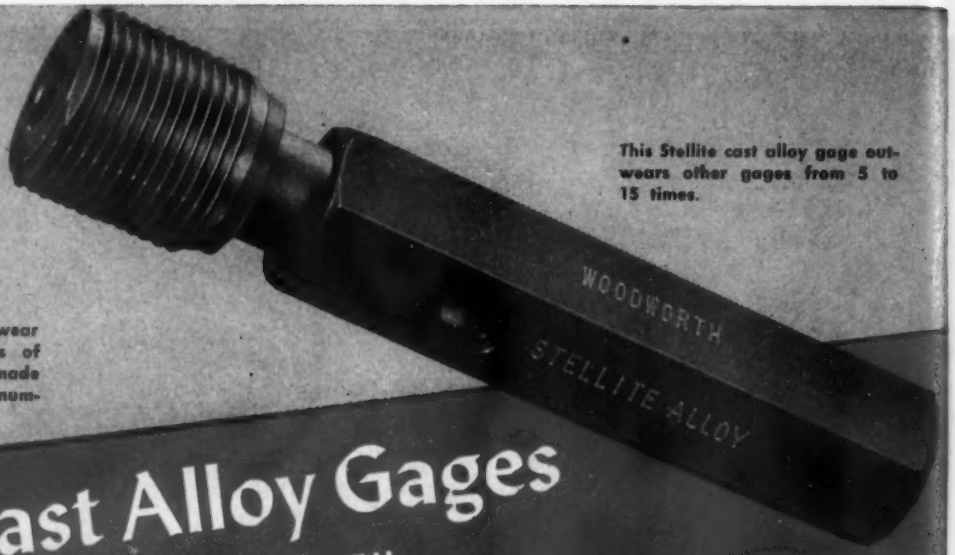
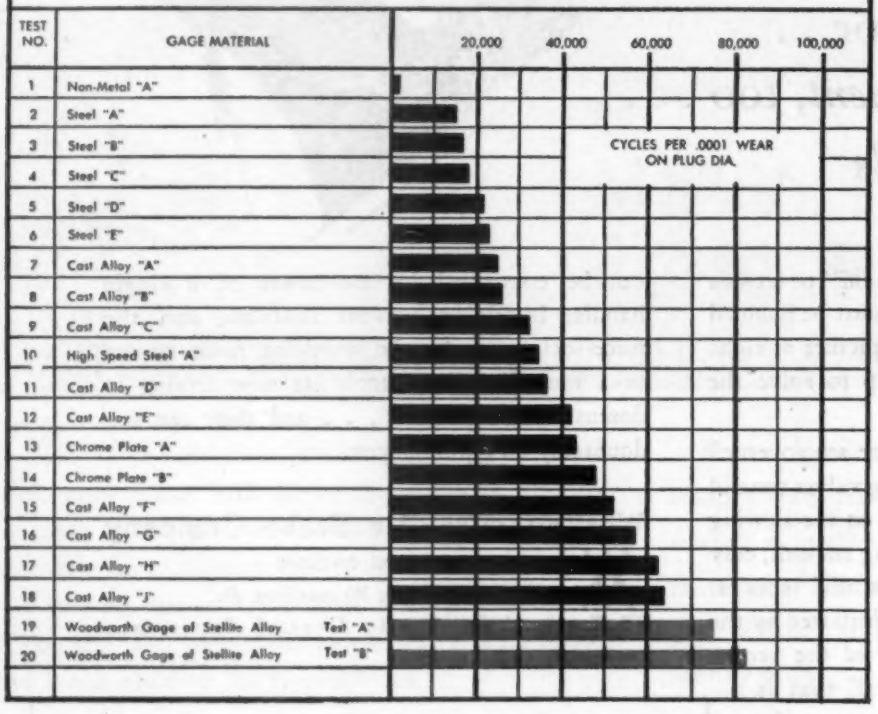


This Stellite cast alloy gage outwears other gages from 5 to 15 times.

Chart below shows by actual wear test how far Woodworth gages of Stellite cast alloy outwear gages made of other materials. Note tests number 19 and 20.

Stellite Cast Alloy Gages BY WOODWORTH Maintain Accuracy Longer

AVERAGE RESULTS ON WEAR TESTS OF VARIOUS GAGE MATERIALS



To test this gage, Woodworth engineers used a specially built wear-test machine — subjecting it to punishment far more severe than in any actual gaging operation. The results of these tests show how effectively Stellite alloy resists abrasion.

It was this and other important characteristics of this metal that led Woodworth engineers to develop the new, tough cast alloy gage which Woodworth offers to manufacturers today — after months of expert research into processing methods.

One important user of this gage says, "Binding and 'freezing' of gages was a problem before we switched to this material."
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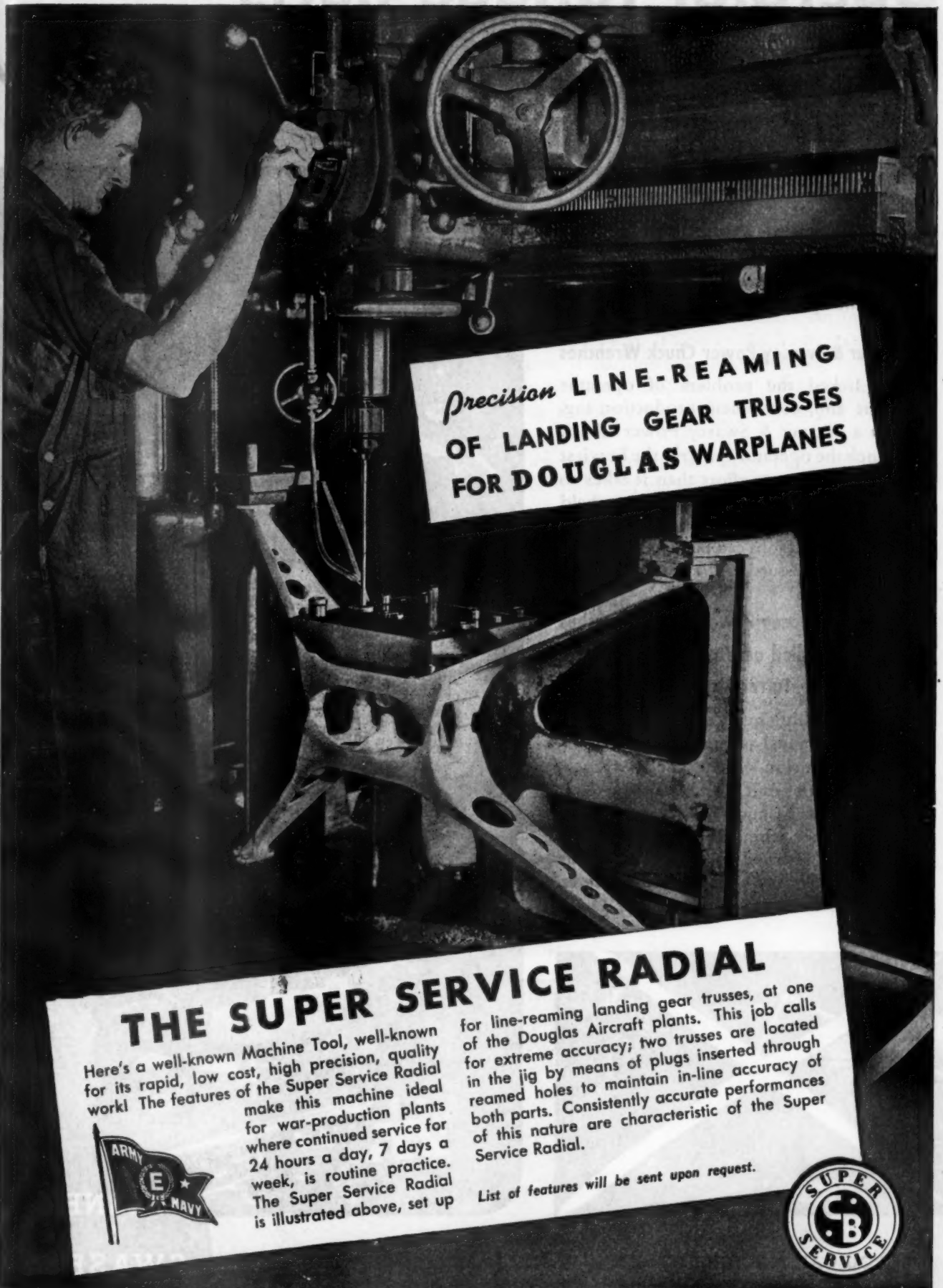


THE SUPER SERVICE RADIAL

Here's a well-known Machine Tool, well-known for its rapid, low cost, high precision, quality work! The features of the Super Service Radial make this machine ideal for war-production plants where continued service for 24 hours a day, 7 days a week, is routine practice. The Super Service Radial is illustrated above, set up for line-reaming landing gear trusses, at one of the Douglas Aircraft plants. This job calls for extreme accuracy; two trusses are located in the jig by means of plugs inserted through reamed holes to maintain in-line accuracy of both parts. Consistently accurate performances of this nature are characteristic of the Super Service Radial.

List of features will be sent upon request.

ARMY E NAVY

SUPER SERVICE

THE CINCINNATI BICKFORD TOOL CO. OAKLEY, CINCINNATI 9, OHIO, U. S. A.

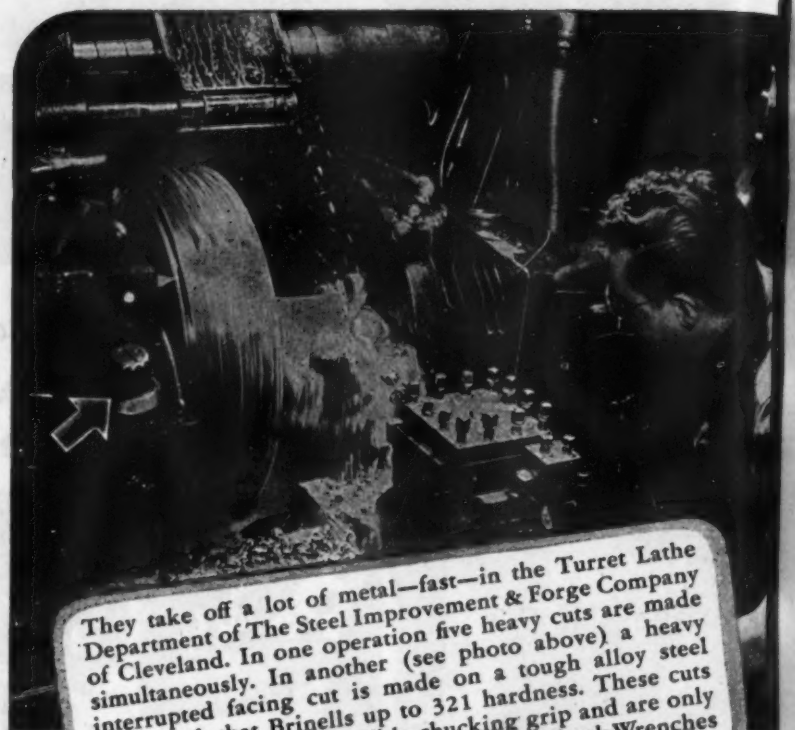
Operator fatigue hurts war production — *eliminate it!*

HAND chucking is hard manual labor and chucking takes time, wears down the operator and decreases efficiency.

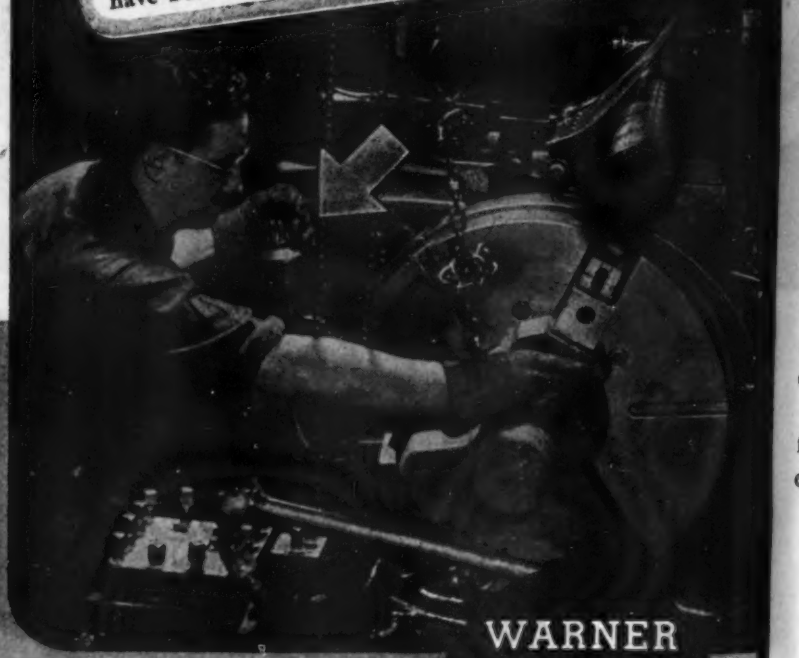
Warner & Swasey Power Chuck Wrenches have licked the problem of operator fatigue and, consequent production sag. With a Warner & Swasey Power Chuck Wrench the operator can grip the heaviest job with no more effort than it takes to turn a door-knob. Heavy work can be held much tighter than with a hand wrench—light, thin-wall jobs can be held with a uniform light pressure to eliminate distortion.

Warner & Swasey Power Chuck Wrenches Can Be Installed on Your *Current Model* Turret Lathes

If you are taking heavy cuts and chucking pieces by manual strength, multiplied by a pipe extension on the chuck wrench, better find out quickly what a Warner & Swasey Power Chuck Wrench can do for you—in faster production, less scrap loss, and better satisfied operators. See your Warner & Swasey field representative or write Warner & Swasey, Cleveland, Ohio.



They take off a lot of metal—fast—in the Turret Lathe Department of The Steel Improvement & Forge Company of Cleveland. In one operation five heavy cuts are made simultaneously. In another (see photo above) a heavy interrupted facing cut is made on a tough alloy steel crankshaft that Brinells up to 321 hardness. These cuts demand the tightest possible chucking grip and are only possible because Warner & Swasey Power Chuck Wrenches have been installed on all of their turret lathes.



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WARNER & SWASEY Cleveland

TURRET LATHES, SADDLE AND RAM TYPES • CHUCKING AND BAR TOOLS • PRECISION TAPPING AND THREADING MACHINES

A Job to Be Done

THE AUTOMOBILE INDUSTRY is preparing its customers for the fact that because of increased costs they will have to pay 20 percent more for their cars after the war than before the war.

It is a safe bet that the industry dislikes that fact even more than its customers do. Motor car makers realize that a vast mass market for their products is dependent upon low retail prices.

One of the knotty problems that you can be sure the automotive people will tackle at the first opportunity is how to get their prices down.

Inevitably they will turn to cost-cutting techniques. The lower the cost, the lower the selling price. The lower the selling price, the more cars will be built and sold and the more workers the industry will be able to employ.

The same principle that applies to automobiles holds good for a thousand other products, from safety pins to refrigerators, from nails to farm implements.

That is what led James Y. Scott, president of the National Machine Tool Builders' Association, to say that "cost-cutting is going to be just about the biggest problem in the entire industrial field."

Cost-cutting is the machine tool builders' meat. It is the main reason why buyers purchase machine tools in normal times. They are eager to improve the quality of their product, to be sure; but they also are constantly looking for ways and means to push costs down.

From inquiry in the field we know that manufacturers after the war will be seeking more than ever to lower their costs. They won't be interested in purchasing machine tools as such, but merely as a means to an end. To quote Mr. Scott again, "The function of machine tools is to cut costs."

Machine tool builders thus have two keys to success in the future, and they must use both of them.

They must design machines that provide the answer for which manufacturers are searching—to make products that will enable people to get better things for less.

They must discard the ancient conception of selling as merely the process of soliciting orders, and in its place substitute sales engineering.

Sales engineering sounds like a $64 name. But its definition is simple. It consists of sending salesmen with engineering training into customers' shops to study how to do jobs better and more cheaply.

"Machine tool salesmen after the war," says Walter K. Bailey, vice president of the Warner & Swasey Co., "won't be selling delivery dates, and won't be selling machines, but will be selling the ability to cut manufacturing costs." That is where sales engineering comes into its own.

The greatest contribution the machine tool industry can make to the postwar world will be to build and sell machines designed to produce more and better goods cheaper.

That is the only way we can hope to approach full employment in peacetime. It also is the best way for machine tool builders to insure their own future prosperity.

It is a challenge that we know the industry will welcome.

Burnham Finney

Production

A surprising number of Cincinnati Shapers are on production jobs—they have stepped out of the tool room into the manufacturing shop . . . Here is a typical example of a Heavy Duty Cincinnati Shaper, using a simple fixture and forming tool, producing with economy and efficiency . . . There may be a spot in your shop where a Heavy Duty Cincinnati Shaper can be used with profit.

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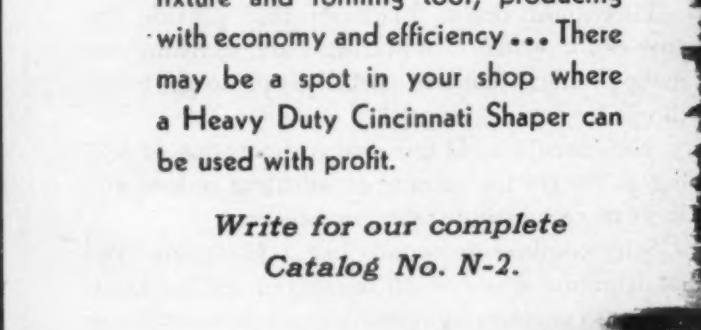

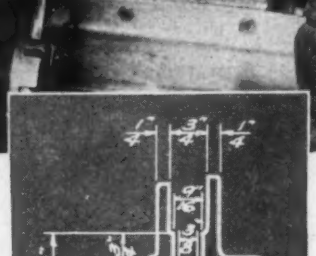

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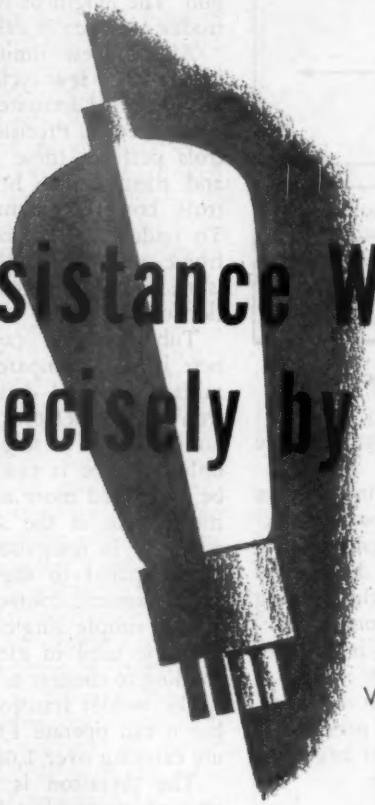


Resistance Welding Controlled Precisely by Electronic Tubes

BY T. R. LAWSON, ELECTRONIC CONTROL SECTION, WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY

Vast wartime production enlarges field of electronic control in fabricating sheet-metal parts. Functions of tubes are explained and compared with older control devices for industrial operations

WARTIME DEMANDS for speed and economy in production have been instrumental in awakening industry in general to the advantages of electronic control and resistance welding in the fabrication of sheet metals. Prior to the war, the automotive industry stood out as a leader in the use of this comparatively new technique.

Aircraft manufacturers agree generally that one rivet costs approximately three cents and that one spot weld, when used in place of the rivet, varies from 1/10 to ½ cent. There are in use today electronically controlled resistance welding machines which make 30,000 or more spot welds in an eight-hour shift. Despite the difference in the greater number of spot welds than rivets required to fabricate the same part, one welding machine can effect tremendous monthly savings in time and actual money.

Sheet metal is an essential requirement in motive equipment. There is a possible use for resistance welding and electronic control wherever metal sheets are joined together. Radio tubes, gun shells, pots and pans, automatic telephone equipment and many other items are being resistance welded and new applications are arising daily.

Many fabricating engineers and plant superintendents prefer the older joining methods, however, because they are skeptical of electronics. This discussion is intended to remove the mystery attached to electronics so that full advantage can be taken of this comparatively new industrial tool.

Resistance welding is accomplished by passing a heavy current through two or more pieces of adjacent metal. The material is clamped between copper or copper-alloy electrodes which apply pressure and conduct heavy current to the junction point. Resistance of metal to current flow develops heat which fuses the metals together. The secondary of a high-current transformer supplies the necessary current to the metal.

Resistance welding machines perform a variety of welding operations and are known as spot, projection, butt, seam or flash welders. They differ essentially only in the form of the welding electrodes.

Spot welding uses stud-type electrodes with small area tips which concentrate both pressure and current for welding metal sheet or other semi-flat structures.

Projection welding is essentially a form of spot welding, utilizing a similar machine but having flat or die-type electrodes. Parts to be welded have small projections already formed on the surfaces to be welded. Heat is concentrated at these projection points. Thus, a series of individual spot welds are made simultaneously.

Butt welding is similar to projection welding except that no projection is raised on either part. Die-type electrodes are used to hold the work which is pressed together and welds at the point of contact. Rods, lengths of pipe, or handles on pans are butt welded.

Seam welding is sometimes called stitch or roller welding because it consists of a long series of spot welds made in rapid succession with wheel-type electrodes. It is of particular value in joining parts where a tight continuous seam is required.

Flash welding consists of holding the two pieces of metal to be added in clamps, one connected to each side of the secondary of the welding transformer. The primary of the welding transformer is energized and the two pieces of metal are touched together

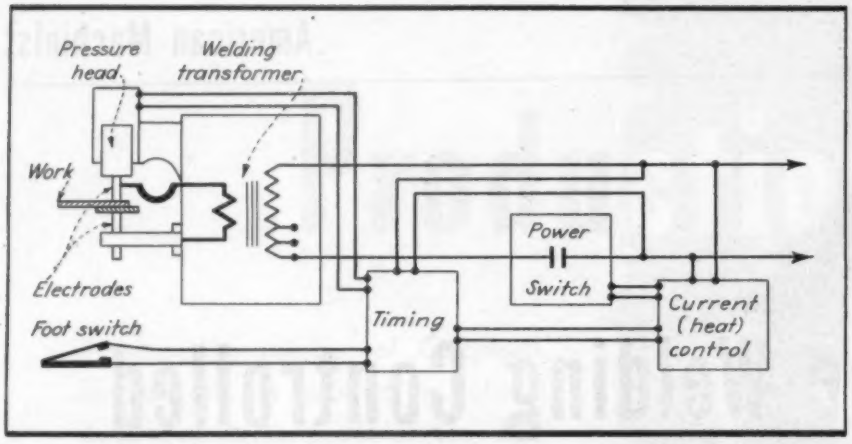


Diagram shows basic elements of a resistance welding machine

momentarily. After electrical contact is made, the two pieces are separated slightly, drawing an arc, or flash, which heats the surface to be welded. When sufficient time has elapsed to heat the metal to fusion point the pieces are brought together suddenly under pressure and the primary current is interrupted. The latter action is called the "upset" period after which the weld is completed.

It is evident that if two pieces of metal are clamped between these electrodes, the secondary of the high-current transformer is virtually short-circuited. Thus, accurate timing of the value and duration of current flow is necessary to prevent burning or warping of the metal. If the current is too low, no weld will result.

Satisfactory resistance welding demands control of the following: The amount of current passed through the work; the time this current is allowed to flow, and the timing and degree of electrode pressure.

In actual operation, the pressure head on air- or hydraulic-operated electrodes is controlled by a solenoid valve. The amount of pressure is determined by a pressure regulator on the welding machine. The first operation in making a weld after the work is in place is to close the foot switch which in turn closes the electrodes on the work. The length of time that pressure is applied before weld current begins to flow is called squeeze time.

Weld Timing Terms

Current is applied to the work by means of some power contact. The length of time that current flows is termed weld time. After current is timed out, there is a period when the electrodes will remain closed and exert pressure to allow the weld to set. This period is known as hold time. Immediately after hold time, pressure is released, the electrodes open and stay open until another sequence is begun. The length of time that the electrodes are open is called off time.

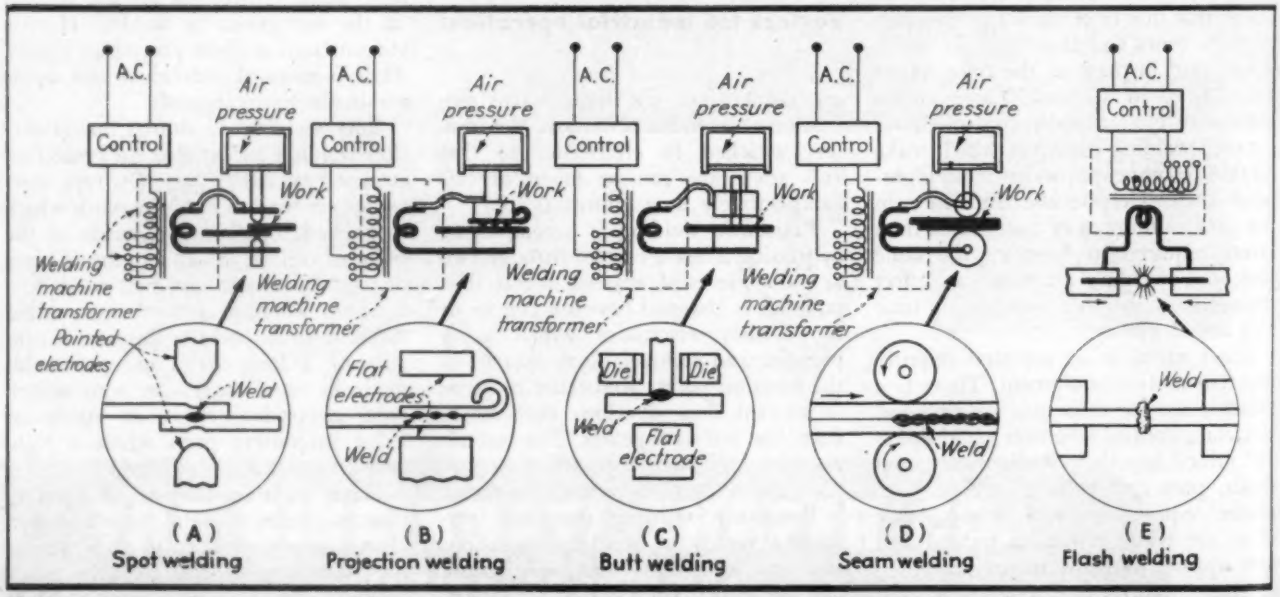
All of these timing periods are a matter of a few cycles but they must be controlled accurately to obtain satisfactory welds. Precision electronic controls perform these functions rapidly and silently. The heart of such controls, however, is the electronic tube. To understand the operation of electronic resistance welding controls it is necessary to understand the operation of the tubes.

Tube function can be understood best if it is compared to a more familiar industrial device. Certain electronic tubes perform a function similar to that of a single-pole contactor, only the tube is much faster and can be controlled more accurately. The ignitron tube is the single-pole power contactor in resistance welding. It can be compared to the familiar single-pole magnetic contactor.

The simple single-pole power contactor is used in electronic resistance welding to connect or disconnect rapidly the welder transformer to the line, but it can operate 1,000 times a minute carrying over 1,000 amperes.

The thyratron is another common type of electronic tube used in resistance welding and it acts as a small single-pole relay in timing and control circuits. If a small thyratron timing or firing tube is placed in the ignitor circuit in place of the switch, the moment when the large power ignitron makes contact, or is fired, can be timed accurately.

The three elements of a thyratron



Various types of resistance welding machines are essentially the same. Cross-sections of typical welds show that the machines differ in the forms of electrodes used

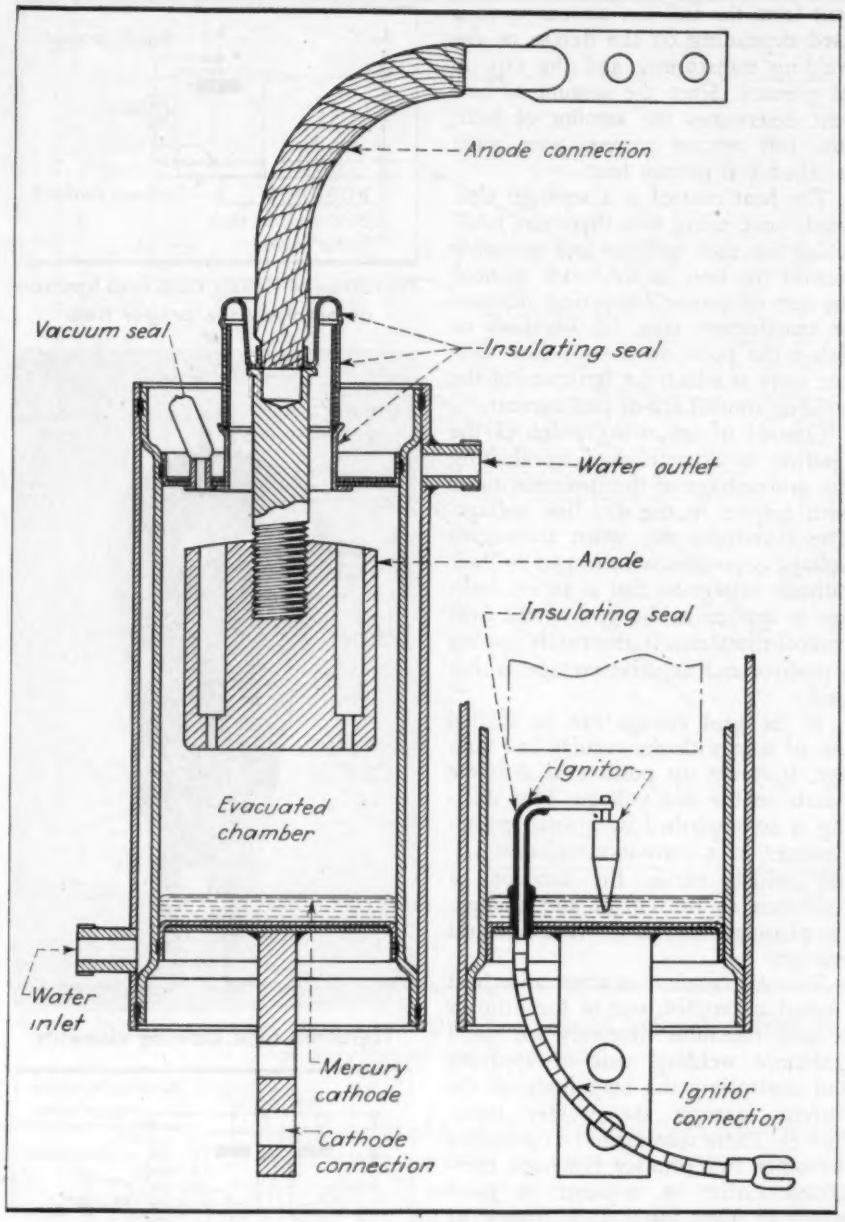
tube are the anode, cathode and grid. The grid blocks or controls the path of current flow from anode to cathode. It is the energizing means of opening or closing the circuit through the tube. By varying the voltage on the grid it is possible to predetermine when and for how long the tube will make contact or pass current. An ordinary welding timer, this grid voltage is adjusted by setting an ordinary dial knob. The dial can be calibrated in cycles of 1/60 of a second so that a selected number of a.c. cycles of current will pass before the grid characteristic changes and blocks off the current.

There are several types of electronic controls for resistance welding, all using either the ignitron or thyratron or a combination of both, depending upon functions the control must perform.

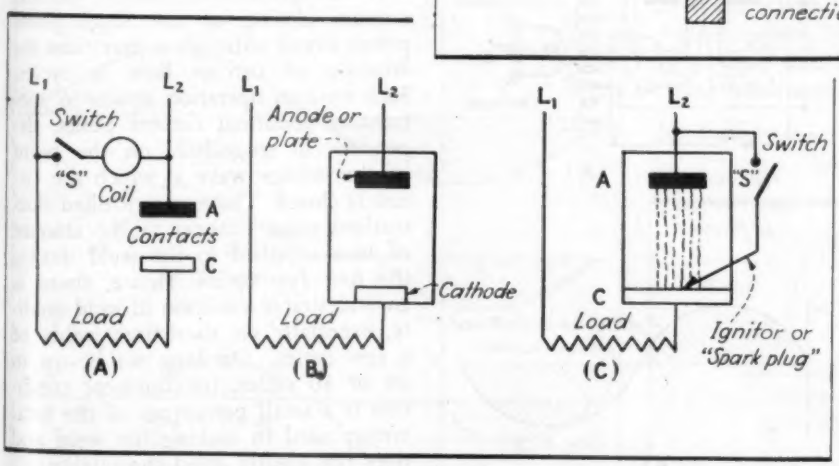
The simplest tube control for resistance welding uses only a single-pole ignitron tube contactor with no timing facilities, such as the Weld-O-Trol. It is applied on any resistance welding machine, within its rated limits, as the line contactor which connects the primary of a single-phase welding machine transformer to the a.c. line.

Two ignitron tubes connected back to back or in inverse parallel are standard in such a unit. If only one tube was used, it would pass only ½ cycle of a.c. current and stop when the line voltage went to zero, since the ignitron passes current in only one direction. To use the next half-cycle, another tube is placed in the circuit with its terminals connected opposite the first tube. This second tube is reduced as the duty cycle is increased.

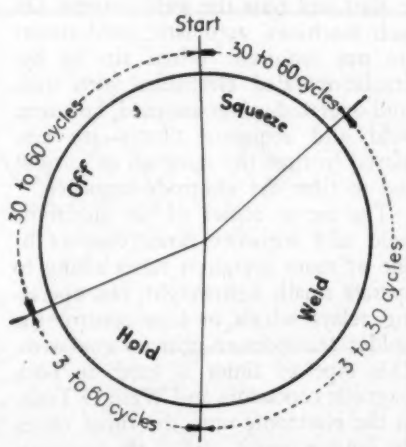
When operating the unit, all cur-



Cross-section of a typical ignitron tube for resistance welding. Shell provides water cooling for the tube



Single-pole magnetic contactor (A) has energizing coil across line L_1 and L_2. Switch "S" energizes or de-energizes coil. When switch is closed, magnetic coil closes contacts *A* and *C*. Ignitron tube as a single-pole contactor is at (B) with anode and cathode replacing contacts *A* and *C*. An ignitor or sparkplug is added in (C) in place of the contactor coil. Ignitor touches mercury pool cathode and electrons flow to anode when switch is closed. A current-carrying path forms and the circuit to the load is closed



Complete spot weld timing cycles

rent from the full a.c. current wave is used depending on the design of the welding transformer and the tap on its primary. Since the amount of current determines the amount of heat, this 100 percent current gives what is called 100 percent heat.

The heat control is a separate electronic unit using two thyratron tubes which fire each ignitron and smoothly control the heat to the work without the use of power-dissipating resistors or transformer taps. It advances or delays the point on the a.c. line voltage wave at which the ignitrons of the welding control fire or pass current.

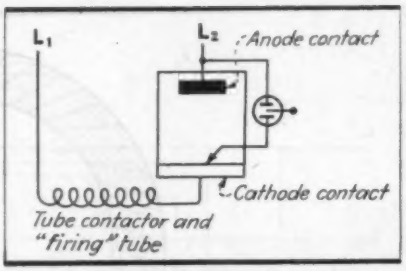
Control of the firing point of the ignitron is accomplished by shifting the grid voltage of the thyratron tubes with respect to the a.c. line voltage. The thyratrons fire when their grid voltage is positive with respect to their cathode voltage so that if an a.c. voltage is applied to the grid of the heat control thyratrons it alternately applies a positive and negative voltage to that grid.

If the grid voltage can be shifted out of step with the regular line voltage, it comes up positive at different points on the line voltage. This shifting is accomplished by a small potentiometer in a resistance-reactance circuit which varies the amount of resistance in the circuit and changes the phase position of the resultant grid voltage.

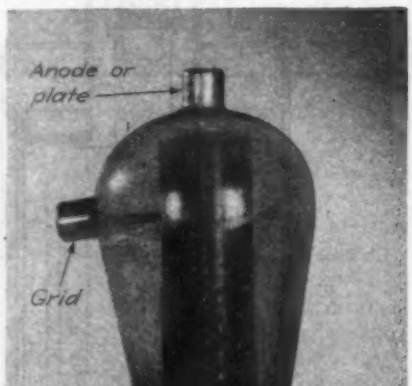
The electronic contactor and heat control accomplish one of the primary control functions necessary for good resistance welding, that of applying and controlling the magnitude of the current through the welder transformer. There remains to be controlled the other two primary functions mentioned earlier as requisite to good welding: The duration or timing of weld current, and electrode pressure and sequence.

Some resistance welders use manual or motor-operated electrodes with cams to start and time the weld current. On such machines, automatic weld timers are not required. When air- or hydraulic-operated electrodes with solenoid-operated valves are used, however, weld and sequence timers are employed to time the duration of current and to time the electrode sequence.

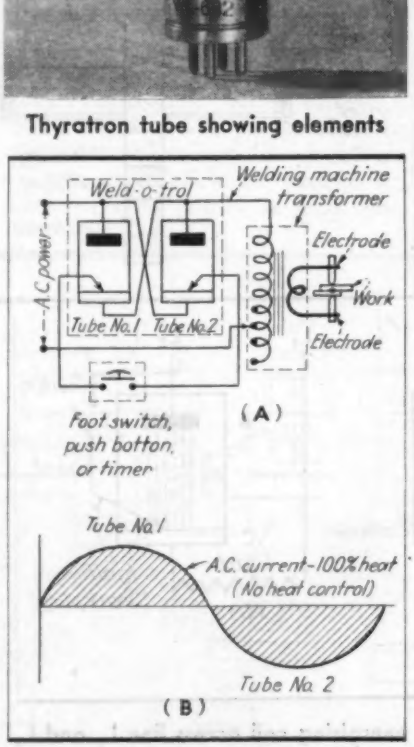
The nerve center of an electronic weld and sequence timer consists of one or more thyratron tubes acting to operate small, lightweight, fast-operating relays which in turn control the welder transformer primary contactor. This type of timer is used on both magnetic contactors and Weld-O-Trols. In the electronic unit, the timer closes the ignitor circuit, and in the magnetic contactor it energizes the magnet coil.



Thyratron or timing tube fires ignitron at precisely the proper time



Thyratron tube showing elements



Weld-O-Trol has two ignitron tubes connected so that alternating action of the tubes provides full a.c. power on the welding transformer as at (A). Full amount of current affords 100 percent heat (B)

The relays in the weld and sequence timer also control the solenoid valve of the welder pressure head.

Split-cycle timing is not needed in ordinary non-synchronous weld and sequence timers for a.c. resistance welding. These units normally are designed to time from 3 cycles to 360 cycles, based on 60 cycles per second power, or from 3/60 to 6 seconds and the method of timing is similar to that under thyratrons.

In this method, a capacitor-resistor time-delay circuit is fixed to the grid of the thyratron. The amount of resistance (adjustable by small potentiometers) in this circuit with fixed capacitances, determines accurately how long it takes to charge or discharge the capacitor. If the capacitor is connected to the tube grid in such a way that when it is charged it applies a positive voltage to the grid with respect to the cathode, the thyratron fires. Several such circuits can be interconnected in one weld and sequence timer each performing one timing function and automatically starting the next one. All of the timing functions can be preset independently of one another, the welder using a foot switch. The complete cycle is repeated as long as the switch is held closed.

Electronic Controls

There are two general types of electronic controls used for timing the flow of weld current. They are known as synchronous and non-synchronous. The weld and sequence timer represent the non-synchronous type weld timer and also combine electrode sequence timing functions.

A non-synchronous control permits random closing of the single-phase power circuit although it may time the duration of current flow in cycles. Such random operation results in momentary abnormal current peaks, dependent in magnitude on the point on the voltage wave at which the circuit is closed. These uncontrolled fluctuations cause changes in the amount of heat supplied to the weld during the first few cycles. Hence, there is an undesirable variation in weld quality, especially on short-time welds of a few cycles. On long welds, up to 20 or 30 cycles, the transient condition is a small percentage of the total energy used in making the weld and does not greatly affect the quality.

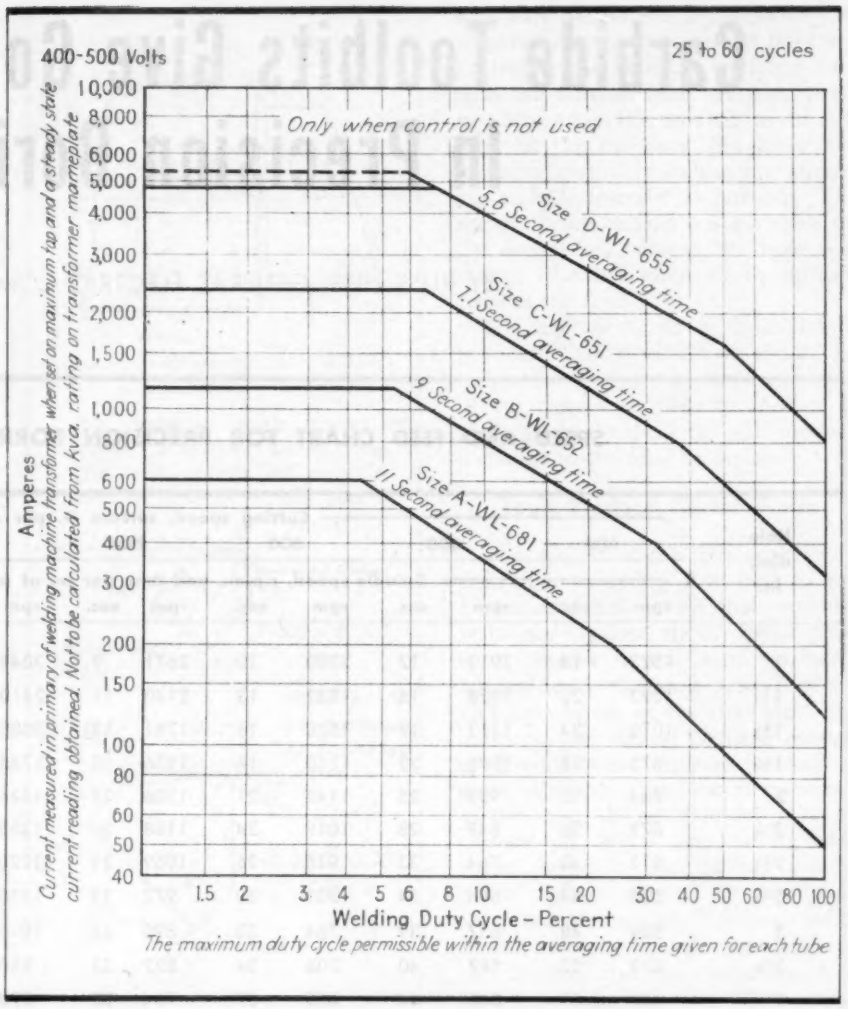
Synchronous control times the duration of weld current in such a way that it closes and opens the power circuit at the same point on the voltage wave for every weld requiring the same heat-setting. High transients are eliminated and more consistent welding obtained. It also prevents closing the

power circuit ahead of the zero point on the voltage wave. Therefore, on short-time welds, where highest quality and good surface appearance are desired, synchronous control is used. This feature of synchronously closing and opening the circuit to the welding transformer is embodied in both spot and seam welding controls. Synchronous control makes full use of split-cycle phase-shift timing of thyratrons.

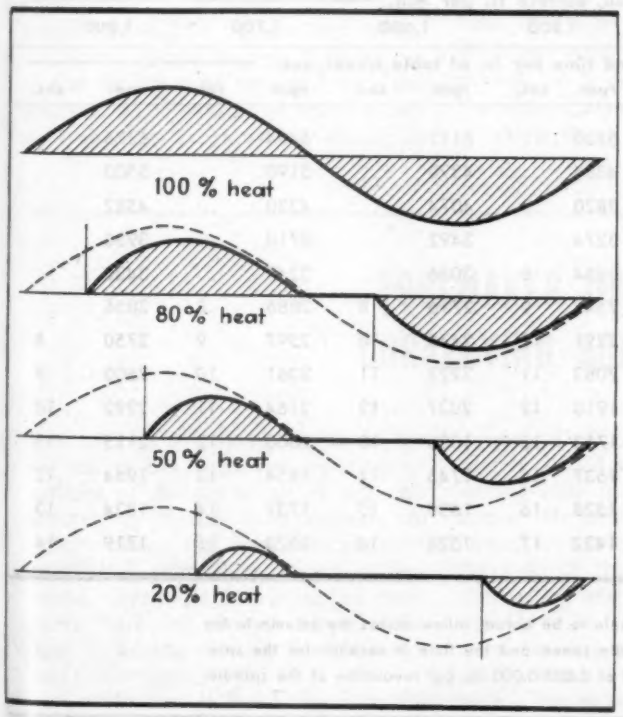
Usually, synchronous controls for both spot and seam welding consist of the synchronous timing element, power tubes and the heat-control circuit. The over-all combinations are then mounted in floor-type cabinets.

Electrode Combinations

Although most synchronous controls do incorporate the power tubes, heat control and synchronous weld timing, no provision is usually made in such controls for sequencing and positioning the welder electrodes. The various methods used by the different sequencing of electrodes is accountable. In some instances, one or more sequencing functions are performed by mechanical switches on the welder head, and the other functions are accomplished electronically. Therefore, there are several combinations of electronic electrode sequence timers to meet such requirements. These units are used in conjunction with the synchronous controls and are practically identical to weld and sequence timers, except there is no weld-timing function as this is done by the synchronous control because of the precision required.

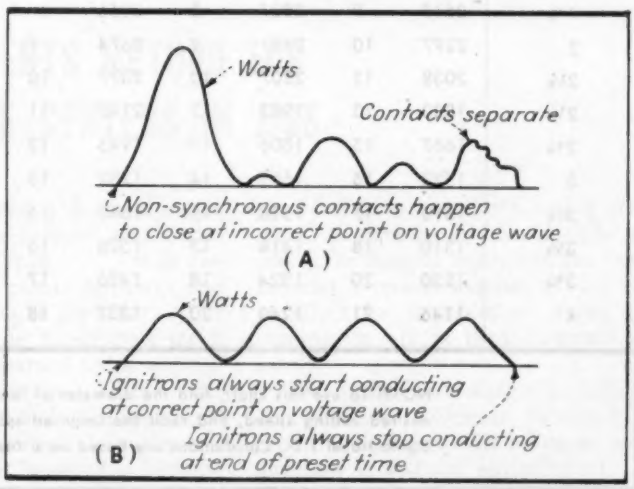


Graph indicates how the current ratings of four sizes of ignitrons are reduced as duty cycles are increased



Various degrees of heat control afford these advantages: Stepless welding current adjustment; compact dial control calibrated in percent of maximum current; economy in welding machine construction by reducing or eliminating autotransformer, primary taps and tap changer

Non-synchronous (A) and synchronous (B) timing control for the flow of weld current


Watts
Contacts separate
Non-synchronous contacts happen to close at incorrect point on voltage wave
(A)
Watts
Ignitrons always start conducting at correct point on voltage wave
Ignitrons always stop conducting at end of preset time
(B)

Carbide Toolbits Give Good Results In Precision Boring

BY RUSS HITZ, GENERAL ELECTRIC COMPANY

SPEED AND FEED CHART FOR PRECISION BORING MACHINES

Hole dia., in.	Cutting speed, surface ft. per min.													
	400		500		600		700		800		1,000		1,100	
	Spindle speed, r.p.m., and time per in. of table travel, sec.													
	rpm	sec.	rpm	sec.	rpm	sec.	rpm	sec.	rpm	sec.	rpm	sec.	rpm	sec.
1	1528	16	1910	12	2290	10	2671	9	3048	..	3820	..	4202	..
1¼	1222	20	1528	16	1832	13	2140	11	2410	10	3056	..	3360	..
1½	1010	24	1273	19	1528	16	1781	13	2080	11	2547	9	2860	8
1¾	873	28	1091	22	1310	18	1526	16	1745	14	2183	10	2400	10
2	764	33	955	25	1148	21	1336	19	1526	16	1910	12	2100	11
2¼	679	38	849	28	1019	24	1188	20	1355	18	1697	14	1870	12
2½	611	40	764	33	916	26	1069	21	1220	20	1528	16	1680	14
2¾	555	44	694	34	833	30	972	25	1110	21	1389	17	1530	16
3	509	48	637	39	764	33	890	26	1018	24	1273	18	1400	17
3¼	470	52	587	40	706	34	822	31	940	26	1175	19	1290	18
3½	436	59	546	44	655	37	764	33	873	29	1090	22	1200	20
3¾	407	60	509	48	612	40	713	34	815	30	1019	24	1120	21
4	382	70	478	52	573	46	668	38	764	33	955	25	1050	22

Hole dia., in.	Cutting speed, surface ft. per min.													
	1,200		1,300		1,400		1,500		1,600		1,700		1,800	
	Spindle speed, r.p.m., and time per in. of table travel, sec.													
	rpm	sec.	rpm	sec.	rpm	sec.	rpm	sec.	rpm	sec.	rpm	sec.	rpm	sec.
1	4584	..	4966	..	5348	..	5730	..	6112	..	6494	..	6376	..
1¼	3667	..	3973	..	4278	..	4884	..	4390	..	5190	..	5500	..
1½	3056	..	3310	..	3565	..	3820	..	4074	..	4330	..	4582	..
1¾	2615	9	2837	8	3056	..	3274	..	3492	..	3710	..	3930	..
2	2297	10	2481	9	2674	9	2864	8	3056	..	3247	..	3438	..
2¼	2038	12	2207	10	2377	10	2546	9	2716	8	2886	8	3056	..
2½	1833	13	1983	12	2140	11	2291	10	2445	10	2597	9	2750	8
2¾	1667	15	1806	13	1945	12	2083	11	2222	11	2361	10	2500	9
3	1528	16	1655	14	1782	13	1910	12	2037	12	2164	11	2292	10
3¼	1410	17	1528	16	1645	15	1763	13	1880	13	2000	12	2115	11
3½	1310	18	1418	17	1528	16	1637	15	1746	14	1854	13	1964	12
3¾	1220	20	1324	18	1426	17	1528	16	1630	15	1731	14	1834	13
4	1146	21	1240	20	1337	18	1432	17	1528	16	1623	15	1719	14

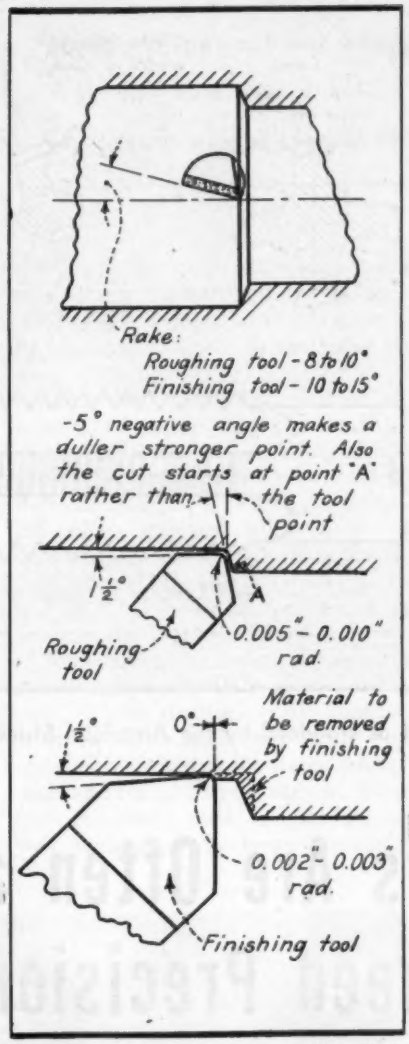
NOTE: To use this chart, find the diameter of the hole to be bored, follow across the column to the desired cutting speed, and read the required spindle speed and the time in seconds for the spindle to travel 1 in. Calculations are based on a feed of 0.002-0.003 in. per revolution of the spindle.

SINTERED CARBIDE TOOLBITS of the harder grades have been found satisfactory for use in precision boring machines. Assuming that the machine, fixtures and bars are correct and in good order, the first consideration is the condition of the workpiece as it is received from previous machining operations. The locating diameter must not be undersize and the locating shoulder must be flat and square with the locating diameter. Any reduction in size of the locating diameter will show up as eccentricity of the finish bore. The locating shoulder if not true will cause the clamps to strain the work out of shape and the bored hole will be out of round.

Adjustment of the machine as to feed and spindle speed is the first step. In roughing, a surface speed of 400 to 800 ft. per min., depending on material and depth of cut, is advisable. Finishing must be done at 1,000 to 1,800 surface ft. per min. Coolant cannot be used at the high finishing speed as it is difficult to keep the working point of the tool flooded, and the chilling action of the coolant will cause hard grades of cemented-carbide tool bits to shatter. A feed of 0.002 or 0.003 in. per revolution of the spindle is recommended for both roughing and finishng cuts. Keep in mind that at each change of spindle speed of the precision boring machine, the feed must be retimed and adjusted.

The depth of cut cannot always be controlled for the roughing cuts, but by adjustment of the speed and changing the angles on the toolbit, a depth of cut of 0.005 to 0.187 in. can easily be obtained. If a wide shoulder with much material to be removed is encountered, it may be well to make use of the facing cams provided with the machine. The amount of material left on a shoulder for finishing should be kept to a minimum. It is necessary to remove only 0.001 in. when finishing to insure the shoulder running true with the finished bore. A good practice is to rough the shoulder to the low limit of the tolerance and allow the finishing tool to just clean up, removing as little material as possible. The use of facing cams is not advisable on the finish cut, because the hole will change diameter when the facing cam reduces the feed.

The depth of cut on the finish should be about 0.005 in. Parts should be roughed to provide a consistent depth of cut from one piece to another as a change in depth of cut will produce a change in the final hole size.


Rake:
Roughing tool - 8 to 10°
Finishing tool - 10 to 15°
-5° negative angle makes a duller stronger point. Also the cut starts at point "A" rather than the tool point
1½°
A
0.005" - 0.010" rad.
Roughing tool
Material to be removed by finishing tool
1½°
0°
0.002" - 0.003" rad.
Finishing tool

These angles on cemented carbide toolbits are recommended for precision boring holes in steel. Roughing tools should be shock resistant, while finishing tools should be wear resistant. A 5 deg. negative angle at the side cutting edge increases the strength of the roughing tool

Tools Produce Mirror Finish

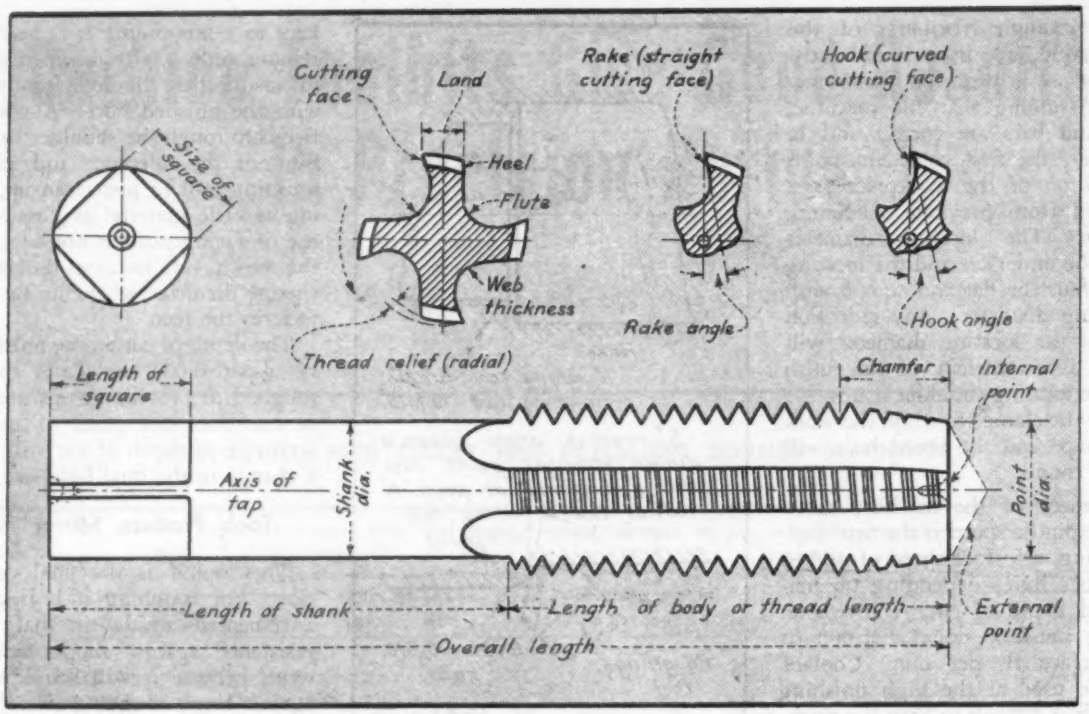
The toolbit is the final consideration. For roughing it is best to use a cemented-carbide tip that provides resistance against shock rather than wear, because it will stand up better against heavy roughing cuts. Tool angles are shown in the drawing. The finishing tool should be hard enough to provide wear resistance, which is more desirable than shock resistance in this case. If no shoulder is to be cleaned up, the 0 deg. cutting edge angle shown in the drawing can be made slightly negative to strengthen the point of the tool. The nose radius should not exceed half the depth of cut. During finishing operations, it is possible to remove 0.00005 in. stock without spoiling either the work finish or the tool edge. A mirror finish results, tool wear is reduced to a minimum, less difficulty with runout is encountered, pressure on the tool edge is less, and clamps need not be tightened as hard, resulting in less distortion. The accompanying table will help to make quick and proper adjustments of precision boring machines.

TOOLMAKER INVENTS METHOD FOR CORRECTING HOLE CENTERS IN JIGS

ONE OF THE MAJOR PROBLEMS in the war effort has been the building of millions of dollars worth of jigs and fixtures, in which hole centers are closely related and must coincide with established centerlines within a few tenths. Even the best-equipped toolrooms have not always enjoyed sufficient jig-boring capacity for the work load thrust upon them.

A toolmaker at Buick has patented a method of bushing holes that are merely drilled and reamed, and the resulting hole is "dead . . ." with the layout. He uses a pair of bushings, one located eccentrically in the other. After check-up of the jig to see how much the drilled and reamed holes are displaced from their true centers, the outer bushing, marked with horizontal and vertical centerlines, is put into a hole. The second bushing is likewise provided with centerlines, and is graduated in degrees if desired. The eccentric bushing is rotated in the outer bushing a certain number of degrees, as called for in tables of center displacements. It is then fastened securely.

The method has attracted considerable attention in Detroit. Whether the eccentric bushings will be made commercially is still not settled.



Tap terms adopted as standard by the American Standards Association

Special Taps Are Often a Requisite Of High-Speed Precision Tapping

BY HERMAN GOLDBERG, CHIEF ENGINEER, R. G. HASKINS COMPANY

TO TAP HOLES EFFICIENTLY and economically, the proper tap must be selected for the material to be tapped and nature of the operation. While any tap will cut a thread, industry now demands better threads, tapped to closer tolerances. Standard taps are not always economical from the user's viewpoint, as they are expected to tap holes in any material, in every type of machine and under all shop conditions. It is more economical to use standard taps wherever possible, but special taps are often necessary.

Shape and angle of a tap's cutting faces influence its performance in most materials, so it is often desirable to alter the face design to suit material being tapped. For cast iron, malleable iron and brass, taps usually have radial cutting faces, although a 3- to 5-deg. rake is sometimes desirable. A 10- to 15-deg. rake generally is better when tapping cast steel, manganese or molybdenum steel, vanadium steel or steel pipe fittings. A hook of up to 10-15 deg. generally is best for cast aluminum, lead, zinc or aluminum die castings, duralumin, nickel-chrome steel, rolled aluminum, hard rubber, certain stainless steels, and monel metal. On the other hand, babbit, copper, and nickel-silver generally can be tapped to best advantage when the tap has up to a 20-deg. hook. Experience also has shown that hook or rake angle often must be varied according to the size of the tap, depending on the strength of the lands.

Tap manufacturers have standardized on certain dimensions, such as pitch, over-all length, size of square and diameter of shank, but other dimensions such as depth and width of flute, width of land, amount of hook and core diameter is individual with each tap manufacturer. Some produce taps with wide lands and shallow flutes, claiming that these taps are much better and stronger than those with narrow lands and deep flutes. This is not always true. In sizes, up to about ½ in. diameter, chip room in the flutes is the most important single factor in the tap selection.

Many small sizes of taps have more than 50 percent of the total cross-sectional area of the tap cut away for flutes, so it is often difficult to eliminate breakage of small taps with coarse pitches. This construction represents poor practice and should be avoided wherever possible, especially when tapping tough materials. When using small taps, power required to break up the chip is sometimes greater than power for cutting the material. The flutes are so narrow and shallow that chips pack into the flutes. When there is no more room left, and tapping is continued, the tap breaks.

One style of tap that shears the chip ahead of itself is commonly known as the gun, chip driver, or spiral-point tap. This type has narrow, shallow

Standard taps are not always suitable for precision tapping. Why and how taps function and reasons for special considerations are explained in this article, the second in a series

flutes, very wide lands, and a shear angle from 15 to 22 deg. Up to 5/16 in. diameter, these taps have two flutes. Metal is sheared and curls ahead of the tap, thus no chips get into the flutes. This tap is stronger than any other style and the sheer angle reduces the amount of power required for tapping. It is ideal for certain classes of work, but has limitations.

The fact that the chips are sheared ahead of the tap means it must be used in a through hole, or a hole deep enough beyond the thread so there is sufficient room for the chips to pack. In blind holes, it is sometimes difficult to remove the chips on account of their springy nature and their tendency to pack tightly. A disadvantage in this style tap is width of the land, which results in increased friction. On certain steels, this causes the tap to load or pick up metal. It is not suitable for work that has a tendency to shrink while being tapped, such as copper, bronze, brass, and material that is cold-headed or upset. In these materials the tap loads rapidly and its life is short. Ideal use for a tap of this kind is in tapping sheet steel and shallow holes where depth of hole is less than two diameters of the tap.

In sizes 3/8 in. in diameter and up, the spiral-point tap is furnished with three flutes instead of two. In these larger sizes, such standard taps have little merit, as their width of land is too great for high-speed tapping. It is better to use standard three-flute taps from 5/16 in. up, and grind a slight shear angle on their cutting edges, rather than purchase standard three-flute shearcut taps. Rarely is there a job where standard spiral-point taps will work satisfactorily. They usually load or pick up metal rapidly at the end of the chamfer, or the start of the shear angle.

Some manufacturers supply as standard, two-flute taps up to 1/4 in. in diameter. These should not be confused with two-flute shear cut taps. They are different in that the flutes are very wide and the lands very narrow. These taps are rarely used, as they are not well understood by many mechanics, but they should be as they have more chip room and less frictional resistance while tapping. In close tolerance work it is difficult to hold size because such taps have very little support on the narrow lands. They are ideal for tapping steel that is soft and gummy, and work well in Shelby tubing, copper, brass, bronze, and upset material that has a tendency to shrink. Because of wide flutes, they have more chip room than any other style tap and are suited to materials that have a tendency to curl chips.

Another advantage of this style of tap is that the chamfer may be given a slight amount of shear, making the tap cut more freely and thus make it suitable for deep holes. Such taps must be kept sharpened, as they are weak in comparison with a two-flute shear cut or gun tap. They are easy to resharpen and are economical to use. This style of tap is not suitable for tapping cast irons, stainless steel, monel, nickel or tool steel.

When specified, tap manufacturers can supply three-flute taps up to and including 1/2 in. diameter. Three-flute taps should rarely be used under the No. 6 size except on very thin material, as small taps do not have sufficient chip room in the flutes. Two-flute taps are better in smaller sizes. The three-flute tap is by far the best for general all-round work up to and including 3/8 in. diameter, and for the coarse pitches, such as 7/16 in.-14 and 1/2 in.-13, it is better than the four-flute style. The advantage lies in the fact that there is more flute room, the tap is easy to resharpen, and is good for close-tolerance work. It will work satisfactorily in all materials. These taps have a further advantage in that they can be ground with a slight shear angle which combines the advantages of shear cut taps with the advantages of narrow lands.

Material to be tapped and nature of the tapping operation must be analyzed before selecting the type of tap. Two-flute gun taps work well for tapping jobs like the one shown above, if the diameter is not over 5/16 in. and the curled chips can be cleared ahead of the tap

Most Taps Have Four Flutes

Most taps have four flutes and generally, unless otherwise specified, this type will be supplied. While satisfactory in sizes above 3/8 in., the smaller sizes are not satisfactory for high-speed tapping, because of lack of room in flutes for chips. When using four-flute taps, in small diameters, flutes must be narrow and shallow.

Even in some larger sizes a three-flute will out-perform a four-flute tap of equal size.

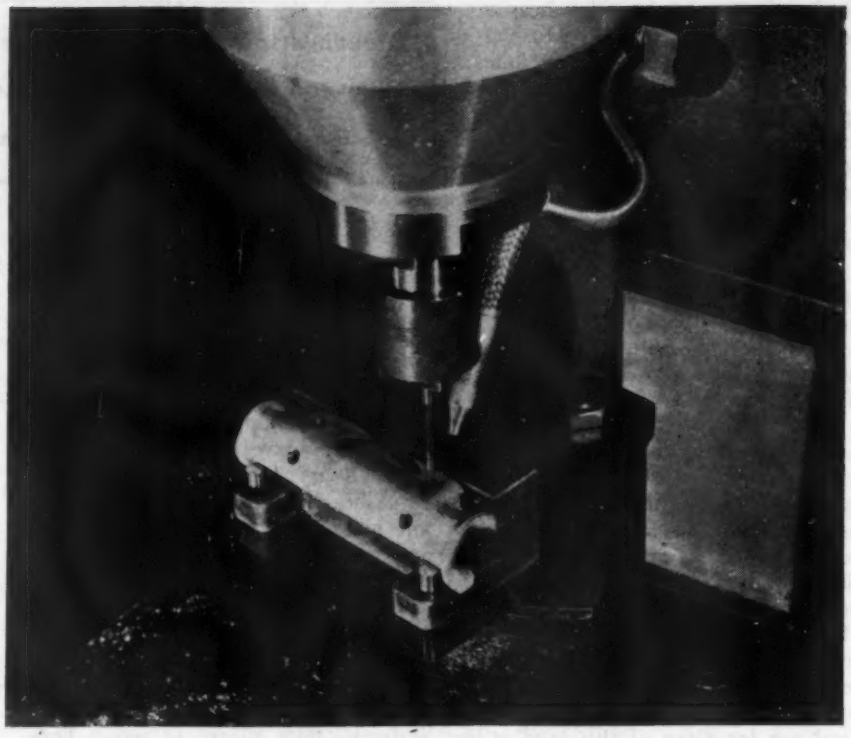
Width of tap land should be governed by the pitch, and should be no wider than necessary to obtain sufficient strength for its cutting action. At present, width of land is governed generally by diameter of the tap. This is one reason why so many taps are ruined in service through loading. For example, on an average ½ in.-20 four-flute tap, land width is approximately 0.100 in., whereas a 1 in.-20 tap has a land width of approximately ¼ in. If 0.100 in. width of land will work satisfactorily on ½ in.-20 pitch tap, there is no reason why this same width should not be used on the 1 in.-20 pitch tap. A ¼ in. width of land is entirely too wide for 20 pitch. Increase in frictional resistance, and extra power required, causes the wide-land tap to load rapidly.

Experience has proven that 1½ to 2 times the pitch is ample for the width of land of the tap, regardless of its diameter. Using the examples cited, 20 pitch is equal to 0.050 in., therefore the maximum land width on 20 pitch should not exceed 0.100 in. This land width would be excessive for a ¼ in.-20 tap. Therefore, the lower ratio should be used for this tap. Here 0.075 in., which is 1½ times the pitch, will be found sufficient for the width of the land.

Land on most taps of large sizes is too wide for high-speed tapping. Some manufacturers claim that these lands are necessary, as narrow lands lack support, but using wide lands to give sufficient support is poor practice. It is better to increase the number of lands and have them narrow enough for efficient cutting. Using the same example, a 1 in.-20 tap with 0.100 in. width of land would not have sufficient support with a four-land tap. Increasing the number of lands to six will give ample support, to maintain close tolerances and still have the advantage of narrow lands. While a six-land tap in this size, with narrow lands, is *special* and costs more than a standard tap, it is more economical to use.

Wide-land taps reduce chip room in flutes of the tap. In smaller sizes, this is important, as physical limitations of a small-size tap do not permit taking advantage of most efficient design. Shallow flutes must be used to get sufficient strength so the tap will not break from cutting pressure.

Tapping jobs on which *standard* taps are used may be difficult because of improperly designed taps. Using properly designed *special* taps will eliminate many difficulties. A special tap with narrow lands will not correct all difficulties in tapping, but it will give the proper style and design of tap so that an attempt can be made to eliminate other difficulties in the machine, material or cutting oil.



A simple swing fixture frequently can be used to advantage where several holes must be tapped in a work-piece. In this set-up, a No. 10-32 two-flute gun tap is used at 1750 r.p.m. for tapping four holes in a 3/32 in. thick steel stamping. Return speed of the tap is 3500 r.p.m. Production averages 480 pieces per hour

Three Types of Relief

Opinions vary as to merit of relief or clearance on taps. Most opinions are based on the theory that all metal cutting tools must have some form of relief or clearance for successful operation and, therefore, a tap should be relieved. This may be due to a lack of understanding of a tap's cutting action. Several methods of relief are provided by tap manufacturers, including: (1) eccentric relief, (2) circular eccentric relief, and (3) back taper relief.

Eccentric-relieved taps are usually relieved on the outside diameter, sides, and root of the thread. There is no standard as to the amount of relief, but usually about 0.0005 to 0.0001 in. is used for standard taps. This is measured from the cutting edge to the heel of the land.

Circular-eccentric relief is a term applied to taps when relief does not come to the cutting edge, but stops part way on the land, the balance of the land being radial. Common practice for relief on taps of this kind is to grind one-fifth of the land radial and four-fifths with eccentric relief. Different combinations of radial and eccentric relief are possible.

Back-taper relieved taps have a larger pitch diameter at the chamfer and a smaller pitch diameter at the back end. The amount of taper is small. Common practice is about 0.0005 in. per inch of thread length. When more than 0.001 in. back taper per inch is used, tap life is materially shortened as each time the tap is sharpened, the pitch diameter is reduced.

Theoretically, on a tap without back taper or eccentric relief of any kind, a three-thread chamfer is all the clearance or relief necessary to make it cut successfully, provided it can be revolved dead true with a tapping machine spindle that is rigid and has no float. When pressure is applied to the tap, the first thread of the chamfer starts to cut. As the tap revolves, the next land starts its cutting action, then the next land, continuing until all lands are cutting on the first revolution. Then, the second thread of the chamfer starts to cut, removing most of the metal out of the first thread cut. Next the third thread of the chamfer does its share of cutting, and at the end of this tap's third revolution one complete thread of full depth and accu-

rate size has been started. Continuing after the third revolution of the tap, there is no more cutting except along the three thread chamfer. Teeth that are not chamfered do not cut, they merely follow in the thread that teeth on the chamfer have cut. Their function is to guide the tap and support while the chamfer does the cutting. If every tooth on a tap did some cutting, there would be little thread left—the deeper the tapped hole the less good thread we would have.

In practice, because of the many inaccuracies of the tapping machine, the spindle, the chuck and other elements, all teeth on a tap actually do some cutting, depending upon accuracy with which the tap revolves. As it is practically impossible to have all the revolving parts of the machine dead true some slight form of relief besides the chamfer of the tap is necessary. A slight amount of back taper is the best form of relief, as this gives sufficient support to maintain close tolerances in the tapped hole, maintains tap size longer, will tap more holes between sharpenings and is less expensive to manufacture. Back taper should rarely exceed 0.0005 in. per inch of thread length, as the more back taper, the less accuracy in tapping.

It is common belief that eccentrically-relieved taps cut easier and require less power, because of their reduced surface contact and less friction. Although on eccentrically-relieved taps there is only a point contact with very little friction other than on lands of the tap, there is another factor which offsets this relief; a relieved tap lacks support in the angle of the thread and usually all teeth of an eccentrically relieved tap actually cut. For this reason it is difficult to maintain close tolerance with relieved taps, chiefly because of lead error.

It is claimed that eccentrically-relieved taps eliminate loading or pick-up of metal because the angle of the tap is relieved and is not in contact with thread of the tapped hole except at cutting edge of the tooth. While this reasoning is true, taps do not load from cutting; they load when they are reversed. When an eccentrically relieved tap is reversed, there is always the chance of wedging fine chips. Hence, eccentrically-relieved taps should never be used when tapping horizontally.

Eccentrically-relieved taps are not to be condemned entirely. Their chief advantage is in certain grades of material that have a tendency to shrink while tapping. When shrinkage takes place, the excessive friction on a non-relieved tap, and the power required to reverse the tap, causes loading. An eccentrically relieved tap sometimes eliminates this difficulty. However, if accuracy is required in the tapped hole, it is necessary to increase pitch diameter of the tap or to tap in two operations, first with an undersized eccentrically-relieved tap and then with a non-relieved finishing tap.

Taps that have a taper, such as taper-pipe taps, must be relieved, as all teeth must cut. Relief must be at the cutting edge and sufficient to permit the tap to cut freely. On tapered taps it is quite common to have from 0.008 to 0.015 in. relief. It is this relief that causes tapered taps to chip out teeth at the cutting edge. This is due to chips wedging in the angle of the thread when the tap is reversed. There is no cure or remedy for this.

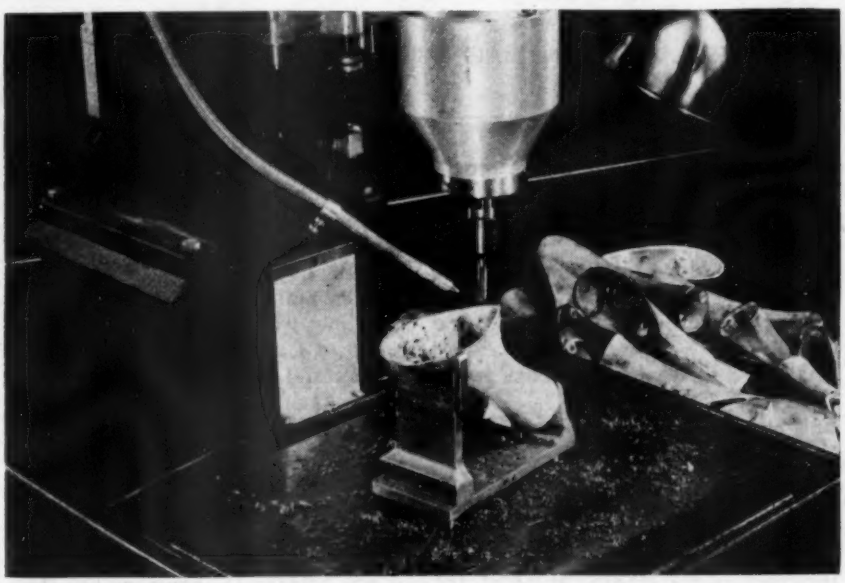
There are other methods for relieving taps. While not common, they are used for special applications. Most of them have little merit for high-speed production tapping. Among the special relieved taps are center-relieved taps, interrupted thread taps, and staggered tooth taps.

Tap Should Be 63 Rockwell C

Observation and tests show that uniform hardness of a tap should be about 63 Rockwell C, never below 61 nor higher than 65. A tap softer than 61 Rockwell C will wear rapidly in corners of the teeth and will load quickly. When taps have a hardness of 65 Rockwell C, they show a tendency to chip in the teeth at the chamfer of the tap.

Recently a new process of heat-treatment has been developed for surface hardening taps after they have been ground. This process has the same effect as nitriding and gives a glass-hard surface on the tap for a depth of about 0.0002 in. This method of heat-treating taps is advantageous, as it eliminates the possibility of having the angle of the thread soft. It is really a simplified nitriding process that is performed after the tap has been heat-treated properly and the threads have been ground. Tests have shown that taps given this extra heat-treatment will cut much closer to their own size than taps not so treated. Such taps are especially suited for use in soft, stringy steel, as the process eliminates to a large extent loading or pick up of metal. These taps also give good results when tapping highly abrasive material, such as cast iron and Bakelite.

Taps that have been chrome plated give no better result than taps not plated. Many tests on different types of taps and methods of chrome plating were used to determine the value of this plating. Taps that are chrome plated will load just as rapidly as unplated taps, and once a chrome plated tap is sharpened the plating has a tendency to chip off and peel where the tap has been ground. When small taps are chrome plated they are considerably more brittle than before plating. The teeth have a tendency to chip out easily. There has been a slight advantage in chrome plating taps for tapping Bakelite, rubber, and similar materials, however, the simplified process of nitriding mentioned above is far better and the cost is considerably less.



No clamps or hold-downs are required to hold the zinc diecast pieces in this tapping fixture. Three 5/16 in.-18 holes are tapped in each piece at the rate of 525 pieces per hour. Previous production with a heavy clamp-type fixture was 280 per hour

The next article in this series will appear in an early number.

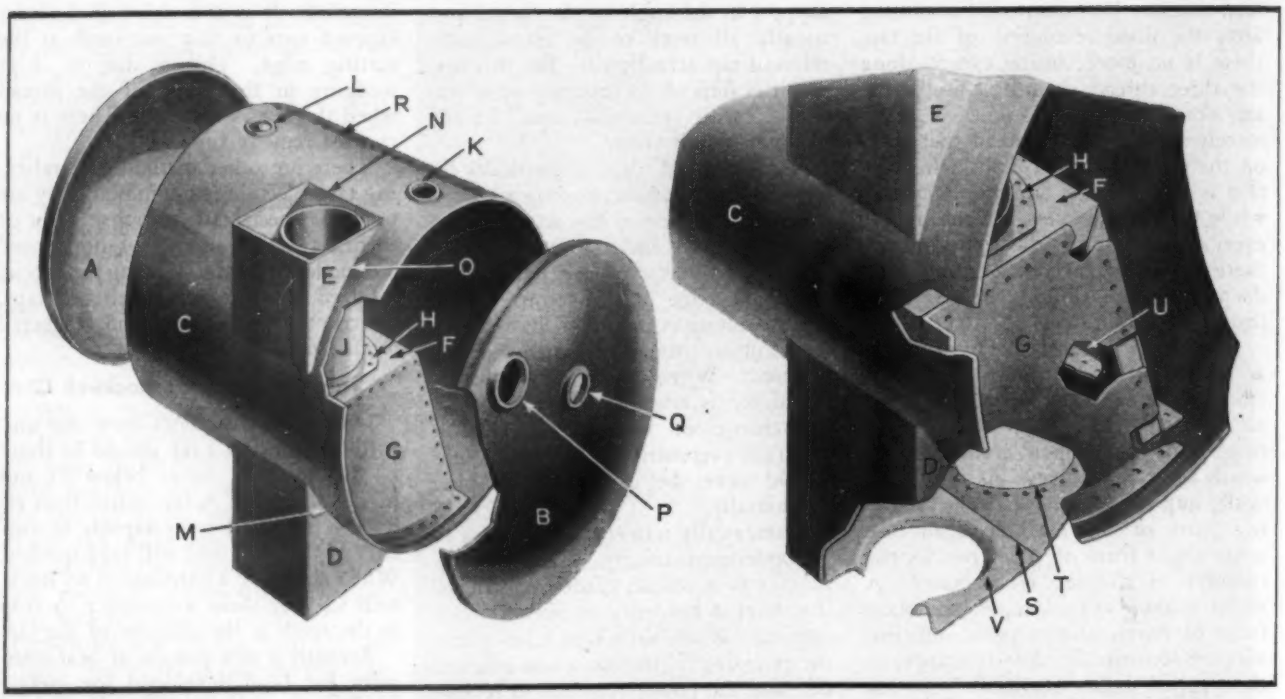


Fig. 1—Magnesium sheet tends to split and crack if a blanked hole is drawn into a collar. The head *B* is first drawn, then the metal at *P* and *Q* is embossed, and finally the holes are blanked out, and *Q* is edged

Fig. 2.—An auxiliary tank within the main tank complicates the assembly problem. Spot welds suffice to make the joints, which are lapped at least ten times the metal thickness

Airplane Tank Demonstrates Forming of Magnesium Sheet

BY W.G. HARVEY AND J. B. WEST, AMERICAN MAGNESIUM CORPORATION

PRODUCTION of the oil tank used in Republic's P-47 *Thunderbolt* fighter plane presents a practical demonstration of general forming practices applicable to magnesium-alloy sheet and offers some interesting applications of design principles and modifications.

Forming practices, outlined in an article "Magnesium Sheet Is Easily Formed When Simple Precautions Are Observed," are embraced in fabrication of the airplane tank.

The tank design conforms to standard specifications of the Army Air Forces and has been influenced by requirements involving resistance to vibration and internal pressure. It embodies features of monocoque construction; no internal part is subject to imposed tensile, compressive, or inertia loading except for certain integrally bonded parts which perform the function of an auxiliary tank during certain momentary attitudes of the aircraft. AM3S-O flat sheet of 0.064 in. thickness is the starting material for all sheet parts. A weight-capacity ratio for the complete tank of 0.460 lb. per gallon, based on full capacity, has been achieved with this design.

Production rates for parts made from magnesium are comparable to those for aluminum articles when certain precautions are observed in design of press tools and the application of heat

General design considerations applying to fabrication of the tank follow:

Bends formed cold, $4t$ to $5t$ minimum radius, (t = thickness of sheet).

Bends formed hot, $2t$ to $3t$ minimum radius.

Spot welds, lap with surface contact of $10t$ minimum width

Corner and butt joints, torch weld

Lap joints, Helraic weld

AM3S-O is the alloy described by Army Air Forces' Specification No. 11339 and contains 1.5 percent manganese, and the balance magnesium.

The vertical cross-section of the tank is not circular as shown in Fig. 1; it consists of two hemicircular areas of 8¾ in. radius, separated by a central rectangular area of 2 in. width. Thus, the two heads, *A* and *B*, which are alike in size and general contour, com-

prise two spherically curved areas of 17½ in. radius and a single-curved central zone 2 in. wide. This departure from the simplicity of spherically crowned heads is a complicating factor in the drawing and trimming operations. During the draw, the heads tend to fracture at the points of tangency between the circumference of the circular sections and the straight portions of the flange. This tendency is overcome by making certain that the "grain" or direction of rolling of the sheet lies in the horizontal transverse direction; that is, parallel to the shorter plane of symmetry of the head. The heads have a knuckle of ⅝ in. radius and a cylindrical sector of ⅛ in. length, adjacent to the point of attachment to the skin sheet. Total depth of draw is 3½ in. approximately.

Single Operation for Heads

The heads are drawn in a single operation, performed at room temperature. The equipment used for this operation is a double-acting mechanical toggle press of 205-ton capacity, having an average punch speed through the working stroke of the operation of 20 ft. per minute. Ordinary yellow laundry soap is used as lubricant, experience having demonstrated that this is more successful in reducing scrap losses because of breakage than tallow, paraffin, or tallow-paraffin combinations. After the draw, head *A*, can be trimmed, washed in hot water for removal of lubricant and dirt, and completed by attachment of a bonding clip. The attachment is made by spot welding.

Head *B* must provide two openings, *P* and *Q*, pierced and edged for the attachment of a filler neck and a flanged fitting by butt welding. It is not feasible to prepare opening *P* by conventional blanking and edging, because of the tendency of the blanked edge to split and crack. This head, therefore, is first drawn, as in the case of head *A* and then embossed outward in a second operation using the same draw tools plus an embossing plate inserted in the punch, provision having been made in the knock-out for receipt of such an insert. Draw tools are essential, as the drawn shell must be positioned accurately for correct location of the embossing. Additional laundry soap is applied locally, and heat is applied by torch while the work is in the tools. Darkening of the soap to brown or black indicates that the proper working temperature of 400 to 450 F. has been attained After embossing of *P*, the two openings are blanked out, and opening *Q* is edged in single-action press operations at room temperature. The head is then completed by trimming, washing and attaching a bonding clip.

Trimming is deferred until all press operations are completed, in order to hold the tolerances required on the location of the embossed holes, *P* and *Q*. Stress put in the part by cold draw work and the large springback likely to occur after trimming, particularly on a comparatively large shallow draw, such as these heads, must be considered carefully. The trim is accomplished by sawing and the dimensions are controlled by appropriate jigs. Trimming on a lathe as in the case of a circular shell is not feasible as the elongated contour introduces lateral pressures at the cutting edge, and results in checking or tearing.

In preparation of the sidewall or "skin" sheet, all press operations except edging of the vent openings *K* and *L* are done while the sheet remains flat. The two openings are blanked; the edge at seam *N* and a corresponding one on the bottom of the tank are blanked, and the slots at *M* and *O* are cut out, all by single-action press operations. The arrangement of slots permits integral formation of the skin sheet and the vertical rectangular side of the hopper housing. The sheet is rolled to cylindrical form, and the longitudinal seam *R* is made by torch butt welding. The seam can be straightened by hand after welding, but the operation is done as well and much more economically by planishing the entire seam in a press brake in one stroke. The hopper housing is also formed and flattened by the press brake. Final forming operation is edging of the vent openings *K* and *L*, performed on a single-action horn press. This work is all done at room temperature.

The two segments *E* are cut to shape in a single-action notching operation and are attached by a torch-welded seam, *O*, to the skin sheet. The sections *D*, together with the two rectangular bottom sections, are formed in one piece. The blank is rough-sheared, then routed to final shape. In three successive single-action press operations, the 4-in. diameter hole *T*, Fig. 2, is blanked; the circular group of twenty 0.221 in. holes, together with four rivet holes for attachment of a steel tapping ring, is pierced; and a 3 1/16 in. hole, subsequently to be edged, is blanked. The edging operation is severe, forming the metal to a depth of ½ in. over a ⅜ in. radius. Finished size of the hole is 3⅝ in. Although it would appear that edging of this type is not severe when compared to draw work, it should be kept in mind that draw work allows the metal to be drawn into the die from surrounding areas, thus placing the metal in compression at the same time tension is applied by the punch to the bottom of the draw; whereas edging does not allow such drawing-in and places the metal in tension.

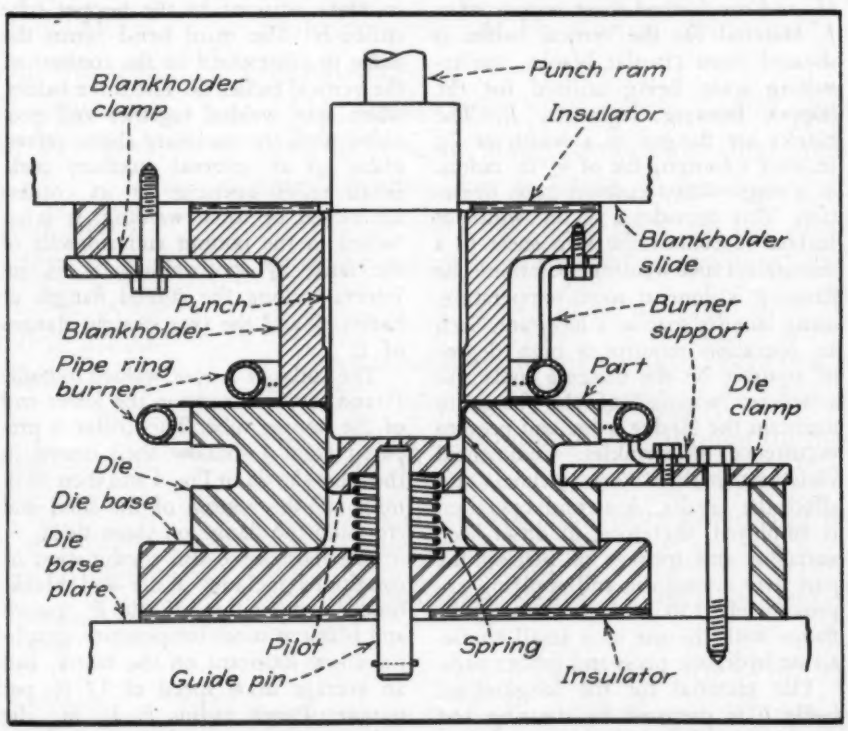


Fig. 3—A double-action press is required to blank a large opening on the underside of the oil tank. Both the blankholder and the die are heated to 500 F. with gas flames, and the sheet is preheated to 430 F.

These requirements necessitate use of a double-action press, application of heat to the tools, and careful lubrication. The general arrangement of tools for this step is shown in Fig. 3. Both punch and die are heated by gas flame, the optimum temperature being 500 F. No great blankholder pressure is required, the only necessity being to prevent wrinkling and buckling in areas adjacent to the opening. A 20 percent admixture of graphite in beef tallow is a suitable lubricant, being reasonably stable at the working temperature. It should be applied liberally to the upper side of the area to be deformed, thus eliminating the necessity to lubricate the tools. Lubrication of the underside of the blank is not required. In production it was found advisable to preheat the work by means of a continuous (muffle-type) furnace and maintain a working temperature of approximately 430 F. Blank heating increases the pieces per hour, eliminates buckling of the large unformed areas of the blank and maintains equal expansion and contraction before and after edging. The sides of the blank are notched in a single-action press operation, and three bends are made on a brake, as at *S*, Fig. 2. Hand reforming can be done if necessary, and the part is attached by torch welding, as at *M*, Fig. 1, to the skin sheet.

Internal sheet structure comprises two vertical baffles, *G;* one formed longitudinal baffle, *F;* a drawn collar, *H;* and the formed sheet hopper tube, *J*. Material for the vertical baffles is sheared from circular blanks, the resulting scrap being utilized for the hopper housing segments, *E*. The blanks are flanged to a width of 7/8 in. over a forming die of 1/4 in. radius, in a single-action cushion press operation. This provides a 5/8 in. width of surface to contact the skin sheet in a subsequent spot-welding operation. The flanging is done at room temperature, using laundry soap as a lubricant. Such an operation requires a high degree of accuracy on the flanging tools and a severe "wiping" of the flange to maintain the 90-deg. edge and prevent occurrence of wrinkles. Commercial variations in sheet stock thickness also affect the results. A second operation is employed, therefore, to offset such variables and consists of placing the part over a steel die and applying approximately 150 tons pressure to the flange with the use of a small single-action hydraulic press and rubber pads.

Flat material for the longitudinal baffle *F* is prepared by shearing and notching, and by blanking out four check-valve openings similar to *U*. Rivet holes are pierced, providing for attachment of the check valves. Three bends are then made, all having inside radii of 1/4 in. or 4*t*. One bend forms a 7/8 in. flange for spot welding to the bottom of the tank, and another forms a 1 1/8 in. flange to spot weld to the sidewall. This latter width of flange is essential for spot-welding clearance in areas adjacent to the hopper tube collar *H*. The third bend forms the baffle to correspond to the contour of the vertical baffles *G*. The three baffles, when spot welded together and provided with the necessary check valves, make up an internal auxiliary tank. Small relief openings at its corners are closed by torch welding. It is attached to the bottom and sidewall of the tank, by spot-welding at 3/4 in. intervals along the curved flanges of baffles *G* and the two straight flanges of *E*.

The collar *H* is spot welded to baffle *F*, and serves to restrain the lower end of the hopper tube. This collar is prepared from a shallow shell drawn in the tools shown in Fig. 4 and then trimming off the bottom of the shell and cropping the flange on three sides.

The most successful combination of conditions includes a die and blankholder temperature of 300 F., punch and blank at room temperature, graphite-tallow lubricant on the blank, and an average draw speed of 17 ft. per minute. Punch radius is 3/8 in., die radius is 3/16 in., and the total depth of draw is 1 3/32 in. The collar is trimmed to 1/2 in. height by facing in a lathe, and the flange is cropped by a mechanical shear.

The hopper tube *J* is formed from a sheared rectangular blank by rolling in a three-roll former. The longitudinal seam is torch welded, and the protruding bead is ground off for a distance of 3/4 in. at the lower end and 1 1/4 in. at the upper end. This is to provide clearance for engagement with the collar and the inlet fitting.

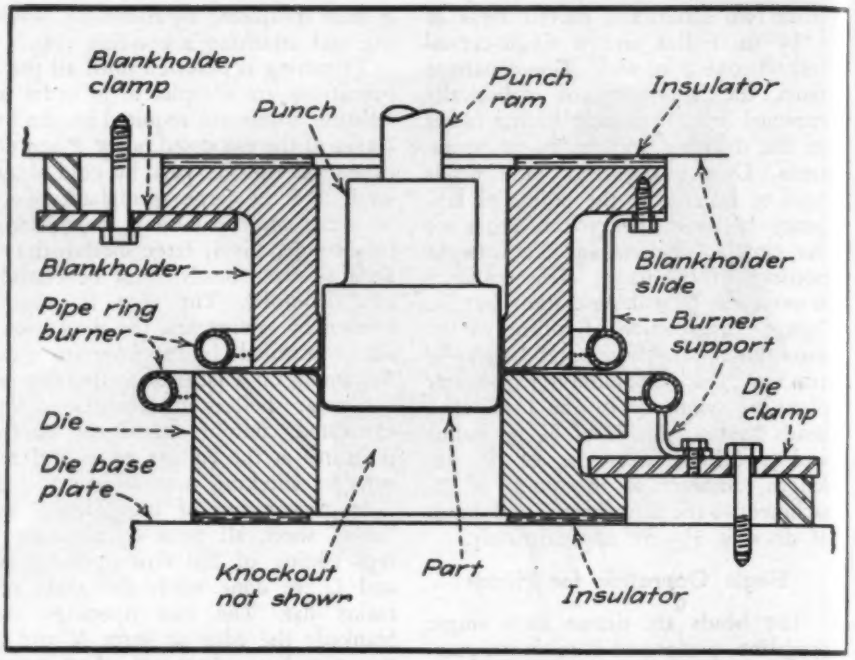


Fig. 4—A collar is produced by drawing a shallow shell and then trimming off the bottom. A punch radius of 3/8 in., a die radius of 3/16 in., and a die and blankholder temperature of 300 F. aid successful drawing of the shell, which is 1 3/32 in. deep

Coating for Sheets

Magnesium alloy sheet is normally furnished by the mills with a coating formed in an acid dichromate solution. If the sheet is to be stored for periods of less than three months before processing, it may be profitable to procure the sheet without this protective coating. Presence of the coating increases the tendency for magnesium alloys to "pick-up" during drawing and forming, and is to some extent objectionable for that reason. Absence of the coating facilitates determination of the direction of rolling, since drainage during the dichromate treatment may produce a grain-like appearance at right angles to the true direction. This is mentioned since the unpredictable performance of draw presses and severe irregular draws sometimes make it advisable to know and utilize the direction of rolling. Finally dispensing with the coating obviates the expense of its removal, which is essential to the success of subsequent spot-welding operations.

THE COST OF *Tomorrow's Peace*

Today peace-loving Americans are united with thirty-three other nations in a common objective of destruction.

Millions of our fine, young men and women find themselves invading foreign lands in order that their own shores may be spared, and their free way of life preserved.

Their sacrifices will be great. Their job will be well done.

But what of the job they will expect of us when they have finished theirs . . . the job of turning their hard-won victory into a lasting pattern of peace?

Can we come up to their great expectation? We must realize that this is the last opportunity of our generation. We must do a better job of it than we did in the Twenties and the Thirties.

We have our backs to the wall, and the scars of World War I and a thirteen-year depression still are upon us. The final test of our way of life is at hand!

As we look over our shoulder into the immediate past, we see little to encourage us. But we also see much to make us pause. We see a tremendous fighting machine, created in a matter of months by the miraculous organization of our resources.

We, the largest of the peace-loving nations, have overnight become masters at the business of waging war. Today, as a result of the coordination of industry, labor, and government, we are producing ***for war alone*** as much as our total normal production for peace.

* * *

We have amply demonstrated our ability to harness the vast productive capacity we possess. Why cannot these resources, which we have organized so efficiently for the destruction of life and property, be directed toward the destruction of the causes of war?

May not the patriotic and emotional strength and the unity of action which have been stimulated for the purpose of winning the war be directed, at least equally well, toward the attainment of world peace and international harmony?

If they are not so directed, what lies ahead but another war? And how can America, in a world that is so rapidly shrinking in size, avoid involvement in ***any*** of tomorrow's conflicts?

International peace is an ambitious dream and its price is high, but the price of war is even higher. Our world cannot long survive the periodic waste of its human and material resources.

Our country can be the most potent single force in bringing about the international understanding that leads to peace, in developing the unity that will make the most of the ample resources nature has provided everywhere.

* * *

There is no unity in selfishness. There can be no unity if any one of the great powers fails to do its part in determining and eliminating from the world the basic causes of aggression.

These basic causes stem from greed and the suppression of opportunity for individual progress; for self-preservation is the first law of nature.

Mussolini's dramatic march on Rome in 1922 was made possible by disillusioned veterans of World War I who could find no jobs and whose future held no promise. Some of Hitler's most

determined followers came from the same ranks.

Men denied the opportunity to make a living, for themselves and for their children, are easy prey to false doctrines and dangerous "isms."

In any realistic appraisal of our domestic problems—economic, labor, racial—it is clear that we can solve them, not by waiting until we reach some utopian accord, but by making a series of compromises. We do this because we know how discord can impair the very roots of private enterprise, self-government, and self-discipline—the essentials of a dynamic democracy.

Similarly, peaceful reconstruction of our world economy depends on the ability of nations to reconcile their differences in a series of working agreements.

If we in the United States want lasting peace and if we want to preserve our democratic way of life, we must take over our full share of the task of initiating these compromise measures. Acknowledging our inescapable responsibility as the greatest economic and military power in the world, we must attempt to insure the free flow of world trade, and develop—with profit for both parties—backward areas abroad as well as at home. And we must do this by making all nations share the responsibility, not by allowing ourselves to be manoeuvered into being an international Santa Claus.

With our allies, we will have to see to it that the devastated portions of the world rehabilitate themselves as quickly as possible; that practicable and realistic trade and economic relations between nations are developed; and that the energies and productive capacities of these nations are set free to function in a climate that is favorable to the growth of free enterprise and individual initiative. As the most powerful economic force on earth, we have the most to gain and the most to lose at the peace table; and we must never forget that with our power comes responsibility.

We cannot hope to solve all of the problems of all nations—nor even all of our own—but our way can become the way for more of the world's humanity. Our strength can become the guiding spirit of the smaller nations.

* * *

In the development of a sound American foreign policy, let us take care not to attempt to control the destinies of other nations. Let us remember that we must set the example of self-determination of independent, free peoples.

Freedom is essential to international peace; and free competition—whether it be between individuals, between businesses, or between nations—is the mainspring, the synchronizer, and the preserver of freedom. For competition always is synonymous with private enterprise.

We are not a covetous nation. We have no territorial ambitions. Our international commercial aspirations are dominated by the conviction that we have a great stake in world unity and world prosperity. We know that we can no longer live apart from other nations and that we cannot ignore the fundamental elements which affect the well-being of other countries.

Our foreign policy must encompass a world of trade, and help develop it.

We dare not blunder in the execution of that foreign policy if the American way of life is to survive. A democracy resolved upon isolation is doomed in the world of tomorrow.

Let us resolve that out of this devastating catastrophe we shall emerge with fuller understanding and greater determination to build the kind of world which can materialize only if this country has the vision and the will to see it through.

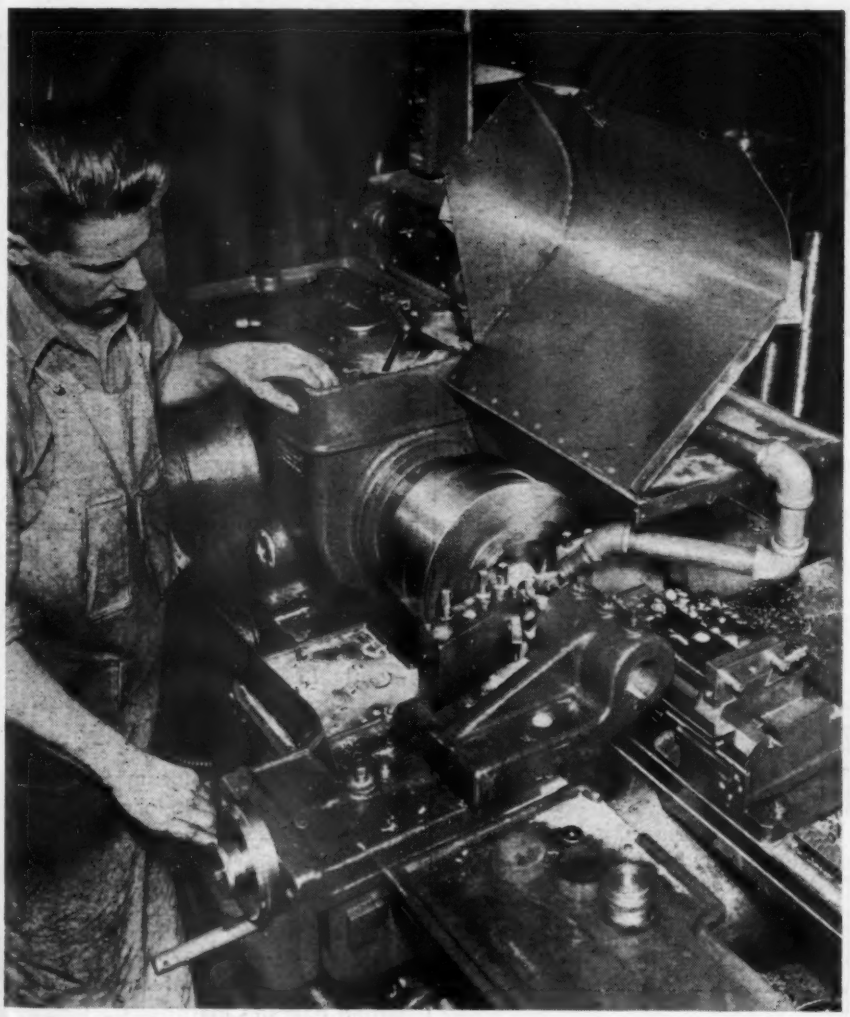
We still are free to decide our own fate—still free to shape our own future. We still are free to preserve the liberty and happiness that has made our country the hope of the world.

President, McGraw-Hill Publishing Company, Inc.

Don't Overlook Automatic Lathes For Turning Parts in Small Lots

BY BENGT BRANBERG, CHIEF ENGINEER, MACHINE TOOL DEVELOPMENT
SUNDSTRAND MACHINE TOOL COMPANY

Time-saving advantages of automatic lathes can be utilized by exercising care in applying the tools required, arranging cycles and organizing production



Facing and chamfering tools are being fed into flute of drill in order to face complete side of part, drill hole, form two chamfers and turn half of O.D. in one operation

MASS-PRODUCTION ADVANTAGES of the multiple-tooled automatic lathe are well known, but many lathe departments fail to expand the usefulness of this machine for short-run work. Actually, many short-run jobs can be handled advantageously on automatic lathes providing the prorated set-up time of the lathe and the reduced turning time obtained with multiple tooling are less than machining time required for other lathes normally used for small-scale production.

In our own plant, profitable savings in time and high accuracy have been achieved in processing steel gear blanks of 125 different sizes in lots of only 20 to 100 pieces in each size. The parts range in size from 1 7/16 in. O.D. × 5/8 in. wide to 8 3/16 in. O.D. × 2 in. wide. Some blanks have one dimension identical and the other different; other blanks are different in both dimensions.

Formerly machined from bar stock on a chucking machine and finished on an engine lathe, these gear blanks are now processed on Sundstrand automatic lathes in three operations. Automatic lathes have reduced total machining time for the entire lot by about 55 percent. Higher accuracy is obtained as finished surfaces are now held to within 0.001 in. in relation to the hole, which is also the locating surface for the hobbing or tooth-cutting operation.

By means of a straddle-facing operation in the final setting, both sides of the rough-turned blank are finish faced, the outside diameter is finish turned, and a finish cut is taken on both chamfers on the O.D., to account for a considerable share of the saving in time. Further time is conserved by feeding the facing and chamfering tools into a flute of the stationary drill during the first setting, making it possible to perform five operations simultaneously.

Another important shortcut on this job is obtained during the third operation by arranging production so that all parts of the same width are turned in sequence. By proceeding in this

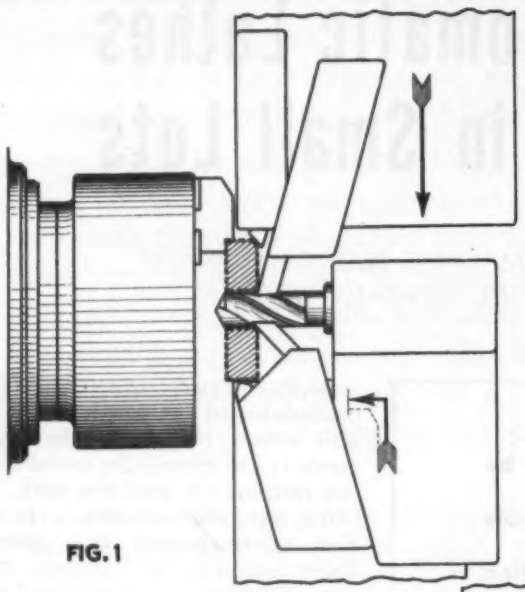


FIG. 1

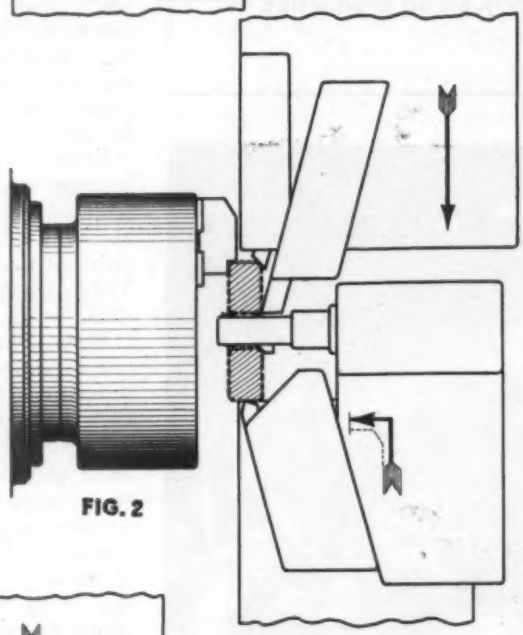


FIG. 2

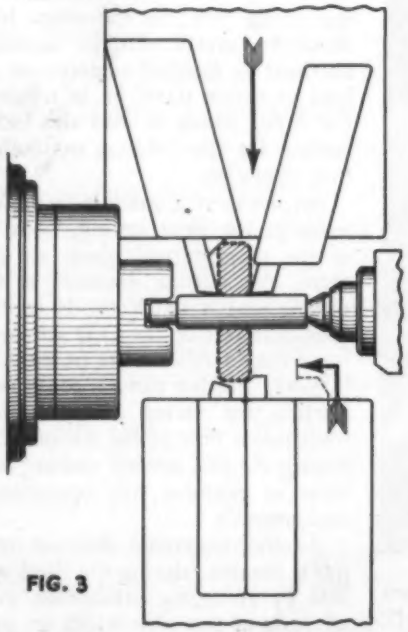


FIG. 3

orderly fashion, machine changeover on many sizes of blanks is reduced to adjustment for the length of the facing stroke, feed and speed changes, and tool changeover for a different diameter.

In such instances, down time of the machine for changeover from one size of part to another is reduced to less than 15 minutes, because the straddle-facing tools need not be adjusted until blanks of a different width are run. Complete changeover averages less than 30 minutes.

The unusually low set-up time, which makes this job possible on the automatic lathe, is attributed to the ease of tool and cycle adjustment on the Sundstrand machine. The rapid approach, feed and quick return phases of the automatic cycle are set-up or changed by adjusting three trip dogs on the edge of a revolving disk. No cams are required. Tools are adjusted most rapidly from master samples of the work.

For small-scale production of gear blanks, parts of 5 in. or less in diameter are cut from bar stock, normalized, and then completely machined in three operations. Gear blanks of more than 5 in. in diameter are normalized after rough machining and then semi-finished in two additional operations.

Sundstrand automatic lathes are used in the three operations; Model 10 for the first two, and Model 8 for the third. The operations follow:

1. Starting with a blank cut from bar stock, the part is chucked on the O.D. in three jaws which extend less than halfway over the width of the part. Then, in an automatic cycle, the hole is rough drilled from the solid, the I.D. is chamfered, and half of the O.D. is rough turned with tools carried on the front slide. Two tools on the rear slide chamfer the O.D. and rough face the exposed side of the part. Facing tool is timed to feed into the flute on the stationary drill so as to completely face the side of the gear blank. A tool on the front slide chamfers the I.D. in a similar manner. The machine and tooling set-up time for

Fig. 1—Tooling diagram for rough turning half of O.D., one face and two chamfers, and rough drilling hole in solid gear blank performed in Operation 1. Drill is stationary! Fig 2—Arrangement of tools for rough turning other half of O.D., other face and two chamfers, and finish boring hole in Operation 2. Fig. 3—Straddle-facing step of Operation 3, shows tool set-up to finish turn O.D., both faces and both O.D. chamfers

Both sides of gear blank are finished faced, O.D. is finish turned, and O.D. chamfers are given a finishing cut in one operation. Gears of same width are processed in sequence to eliminate resetting of straddle facing tools until another width blank is run

this operation totals approximately 30 min., and production is 57 pieces per hour at 85 percent efficiency for a 4-in. diameter gear blank.

2. Part is reversed and chucked on the portion of the O.D. rough turned during the first operation. Essentially the same steps as in the first operation are performed on the opposite side of the part, except that a boring bar replaces the drill in the tooling set-up. The toolbit for chamfering the I.D. is mounted on the boring bar rather than on the front tool block. The finished bore is held to ± 0.005 in. in this operation, and then is hand reamed to + 0.0005 in. —0.0000 in. The operator has ample time to do the hand reaming while the machine is cycling automatically on the next part. The machine and tooling set-up time on this operation runs about 30 min. On a 4 in. diameter gear blank, production is 57 pieces per hour at 85 percent efficiency.

3. Gear blank is placed on an arbor held between centers and driven by an equalizing-type driver. Locating from the bored hole, which is also the locating surface for the gear-cutting operation which follows, both sides of the part are finish faced simultaneously and one corner of the O.D. is finish chamfered by tools on the rear slide. Tools on the front slide finish turn the complete O.D. and finish chamfer the other corner. Stock removal is approximately 0.015 in. on each side and on the O.D. Production for a 4-in. diameter gear blank is about 74 pieces per hour at 85 percent efficiency.

Tool and cycle adjustment for the third operation requires less than 15 min. on gear blanks of the same width as the part previously run. Production is arranged so that gears of the same width but with varying O.D. are run in sequence, and no change is required in the straddle-facing tools until blanks of a different width are run. Where both dimensions change, approximately 30 min. are required for the changeover.

The arbor is of the press-fit type and has a slow taper of 0.002 in. in a 6-in. length. Since it is necessary for the parts to be located in the same relative position on the arbor, it is obvious that the hole in the part must be held to close limits in order to insure the proper press fit. Correct location is obtained by using an arbor press provided with locating bushings. An additional oversize arbor will prove advantageous for use with parts reamed oversize.

The third operation demonstrates how well-planned processing eliminates considerable set-up time. Turning time and cost per part were reduced appreciably without changing the machining procedure. The three operations combine to illustrate the advantages of short-run work on automatic lathes.

Hardening Cutters In an Ice Box

OLD TIMERS have had to revise many of their former ideas. Building up or joining parts by torch or arc welding was a great surprise. We had long joked about a "putting on" tool, and here it was. Metal-spraying came as a sort of flash-in-the-pan and lay dormant until a few years ago. Then torch cutting of unheard of thicknesses gave another jar to old ideas.

They began to make shrink fits by cooling the internal member instead of heating the outside piece. Induction heating came along and seemed to be the long sought answer to the toolmaker's prayer for a means of avoiding scale and distortion. But that isn't all. The latest is hardening steel by freezing instead of heating. Broken cutters are brazed and welded, sharpened and then put in a special ice-box arrangement that takes the temperature down to 120 F. below zero for a couple of hours. They come back to room temperature as hard as ever, believe it or not. And there is said to be no distortion so that accurate and delicate parts can be hardened without distortion or scaling of any kind by the ice-box method. This is not supposed to work on all grades of steel, but it's a step ahead that will surprise many and may have great possibilities.

Practical Ideas

★ **War-Winning Suggestions appearing on these pages were selected from those recognized as meritorious by the Board for Individual Awards, War Production Drive. They are freely offered to industry as an aid to war production** ★

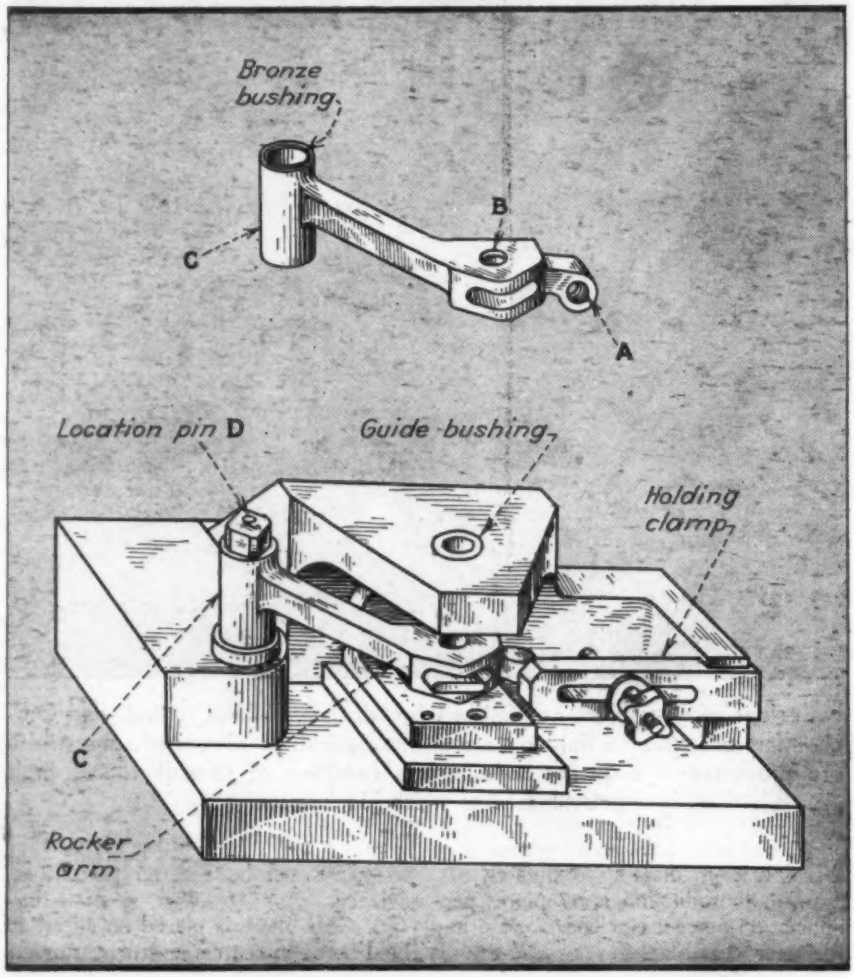
Square Locating Pin Prevents Damaged Bushings

BY JOHN L. CHERRY
Packard Motor Car Company

The operations performed on the rocker arm shown in the drawing are drilling, reaming, countersinking and tapping hole *A*, and drilling, reaming and countersinking hole *B*. Seven fixtures are employed to perform these operations, the rocker arm being located on each fixture by a pin through trunnion *C* fitted with a bronze bushing. Previously a round locating pin was used, and small stel chips worked their way between the bronze bushing and the locating pin, scratching the bearing surface. When this occurred the bushing had to be replaced.

Locating pin *D*, ground with four flat surfaces to provide bearing at four points, is now used. Small steel chips that slip down along the flat surfaces of the pin rarely scratch the bushing.

When using the round locating pin, approximately 400 bushings per day had to be replaced, requiring 16 man-hours each day to make the repairs. The new locating pin has practically eliminated bushing replacements. The result has been a saving of $2,500 in bushings and 4,600 man-hours a year. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



Flats ground on the locating pin on this fixture prevents small chips from scratching the bronze trunnion bushing

Drilling Clean Holes in Thin Sheet Metal

BY ARTHUR K. BAKER

A job often made unnecessarily difficult is that of drilling round and clean holes in thin sheet metal. Standard twist drills produce a ragged or triangular hole, and placing two thicker pieces of metal on each side of the sheet and drilling through all three sometimes cannot be applied, and often is not desirable. The job can be done satisfactorily by using waste or several thicknesses of cloth between the drill and the work.

Locate the drill directly over the point through which a hole is to be drilled, and fold a piece of cloth into a square four or five times as large as the drill and from 1/8 to 1/4 in. thick, depending upon the size of the drill. Place the cloth over the hole location and drill through the cloth and the sheet metal. A smooth round hole results because the cloth prevents drill chatter and keeps the drill flutes from snagging on the thin metal.

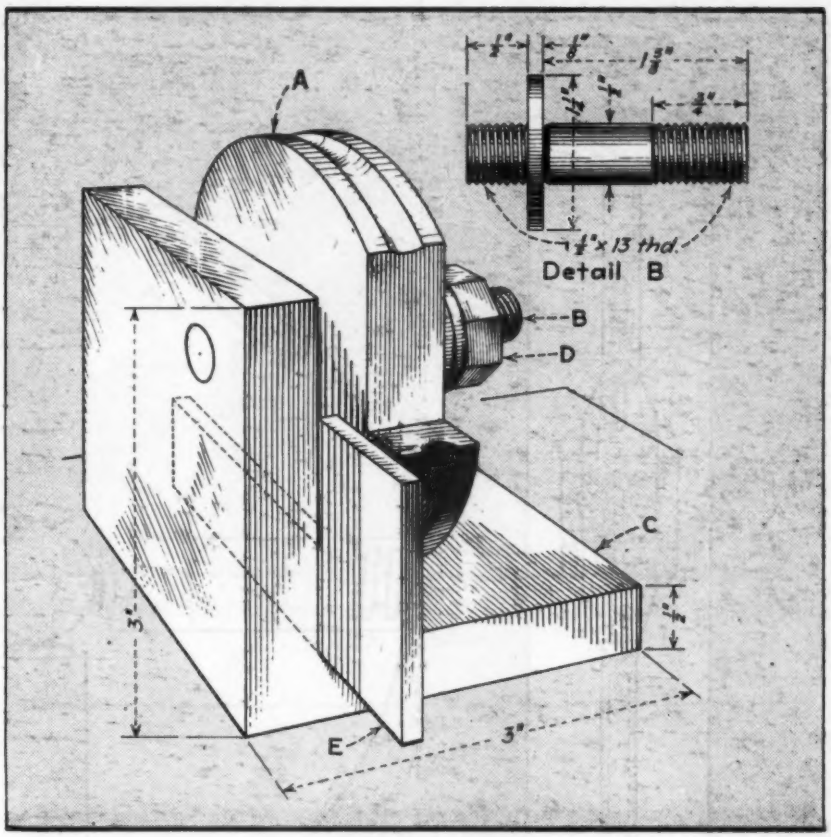
One of the best methods for drilling holes from 3/8 to 3/4 in. in aluminum sheets up to thicknesses of 3/8 in. is to start with a small hole, less than 1/4 in., and then to use helical taper reamers, progresively increasing their size until the desired hole diameter is reached. This method is often used where holes are required for mounting radio equipment on panels.

Fixture for Grinding Circular Form Tools

BY WILLIAM H. MARSHALL

Many of our machine set-ups require circular form tools, the sharpening of which proved difficult when we first started war production. Sharpening the cutters by free-hand grinding, as well as by holding them in a vise, proved unsatisfactory; therefore, I designed the holding fixture shown in the drawing. Form cutter *A* is clamped in the fixture, and can be scribed, ground and checked without being removed.

Cutter *A* is slipped on stud *B* screwed into angle base *C*. When nut *D* is drawn up tight, gage *E* is set in position alongside the cutter, the side of which is covered with marking compound. The cutter is marked at the desired cutting edge with a flat chisel-point scriber, and gage *E* removed. The fixture is placed on the table of a surface grinder, where the wheel is passed over the cutting edge of the tool until the scribed line is met. Gage *E* is again inserted in the fixture, and the cutter checked. In this manner, the distance from the center line of the cutter to the cutting edge can be held within close tolerances. If gage *E* be made to grind cutters 1/8 in. below center, it can be used on any diameter cutter that is held to that dimension. Other gages must be made for circular form tools with cutting edges 3/16, 1/4 in. etc., below center. This fixture now permits relatively inexperienced workers to grind circular form tools. The tools can be assembled on the fixture, marked for grinding, and sharpened accurately in minimum time.



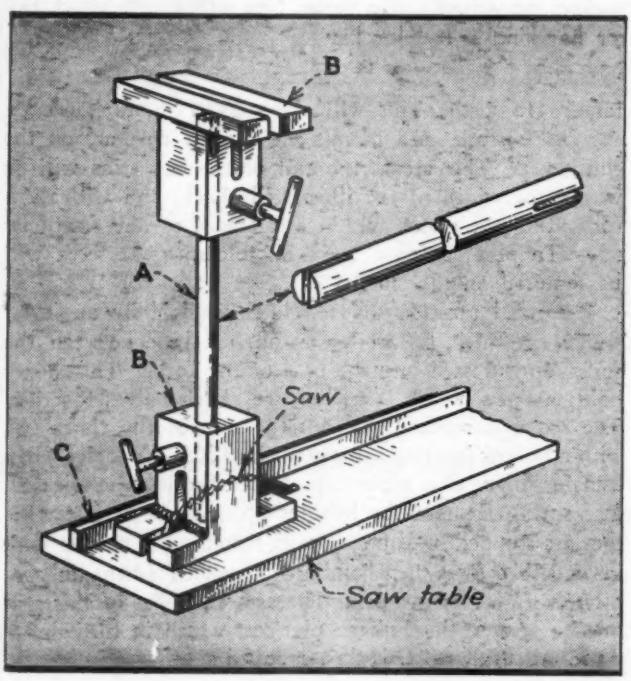
Circular form tools are mounted on this fixture and scribed at the cutting edge. The cutter remains in the fixture when sharpening on a surface grinder

Rods Slotted With Saw Jig

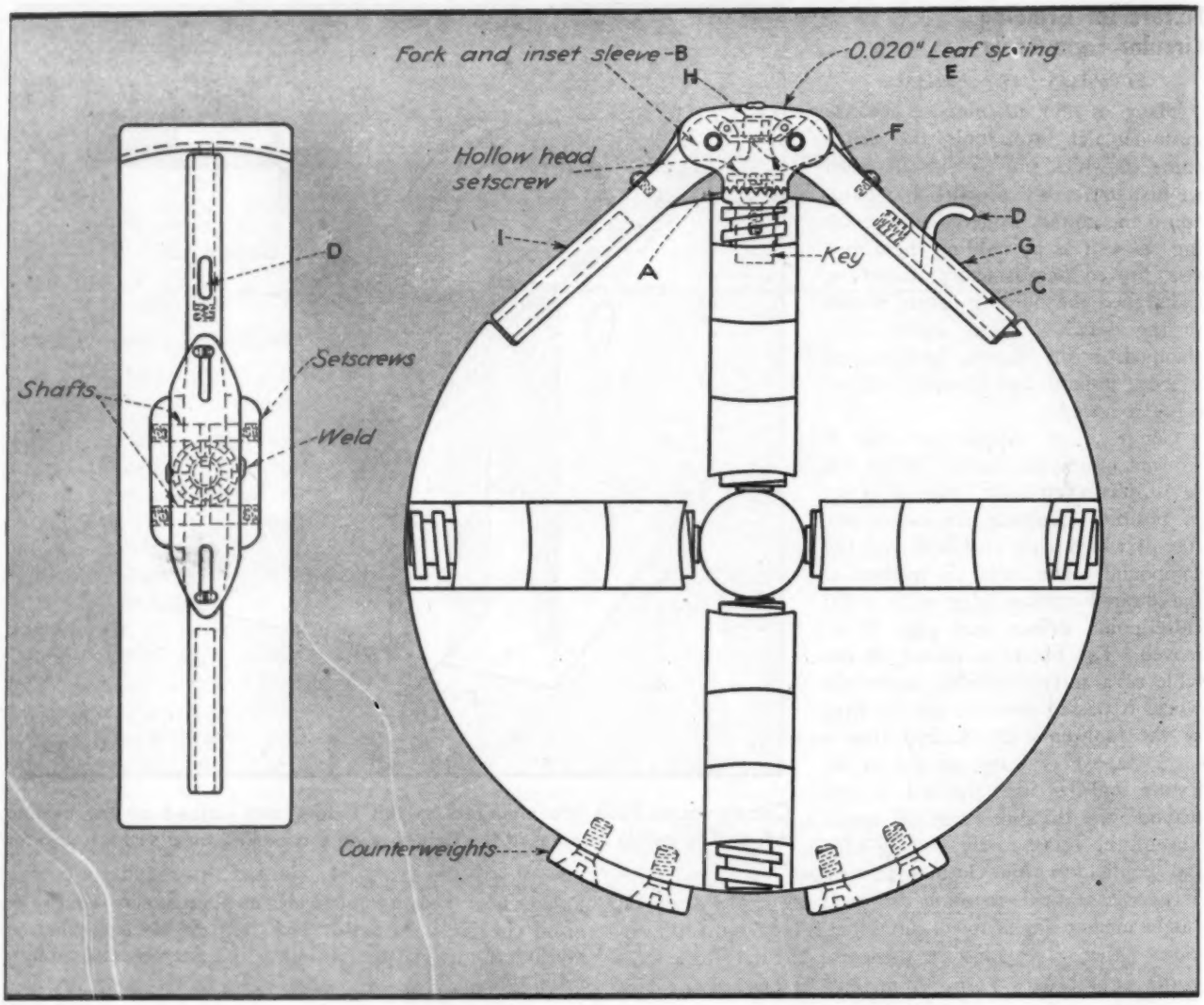
BY ROSS E. SHERWOOD
Douglas Aircraft Company, Incorporated

Rods *A*, shown in the drawing, are 3/8 in. in diameter and 8 in. long, and are slotted 3/16 in. wide and 1 in. deep at each end. The work was previously done on a circular saw with the rods held upright and held flush against the guide bar paralleled with the saw blade.

The illustrated jig was designed to prevent such breakage. Jigs *B* are clamped to the ends of the rods in position to cut the slots 90 deg. to each other. First one jig and then the other is slid along the saw table, using bar *C* as a guide, after the distance between the guide and the saw has been set to permit the saw to enter the slot in the jigs. It is estimated that this method of slotting the rods saves 2,900 man-hours annually. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



Rods of 3/8-in. diameter are slotted accurately at each end by clamping them in this jig, and sliding the jig over a circular saw



When machining large quantities of parts that must be chucked individually in a lathe, this collapsible chuck key eliminates the time required for handling a regular key

Collapsible Chuck Key Saves Machine Time

BY RALPH WAECH

When working with large orders of small parts of equal diameter, it is at times necessary to chuck each part individually in order to perform the required lathe operations. Often, the chucking does not demand much key torque, but only one direct twist to hold the piece. This requires that the key be picked up, the chuck tightened, and the key laid down before starting the machine. The illustration shows how the key can be carried with the chuck. Although the weight of the key will throw the chuck slightly out of balance, this weight can be counterbalanced as shown.

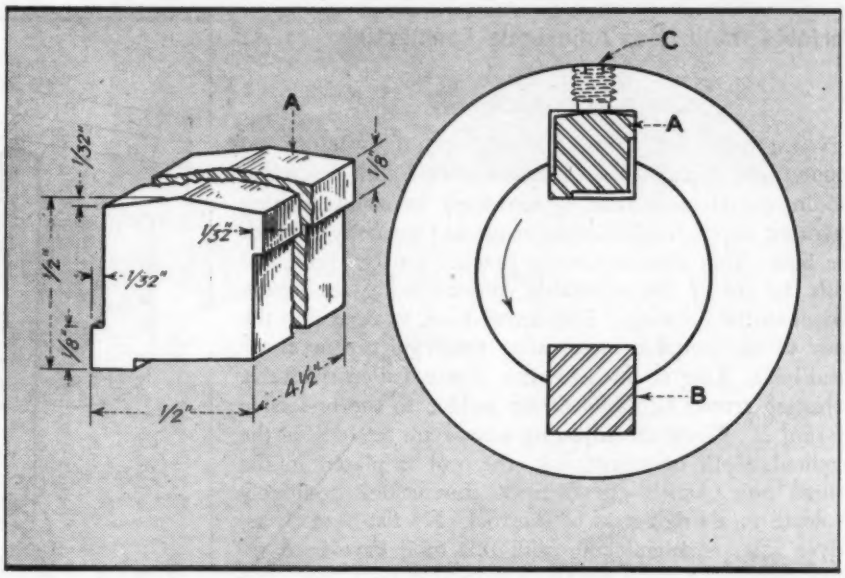
Since the parts to be machined are generally of a common size, the chuck key will always face approximately in the same direction. Positioning clutch *A* permits the key to be set for variations in diameter within tolerances. This clutch has a number of teeth depending on the lead of the chuck screw. A chuck screw having a ¼ in. lead will require 16 teeth. This will allow 0.007 in. tolerance on the chuck stock, and permit about a 12 deg. arc on the chuck key. This arc at the end of the key arms will be within the width of the illustrated chuck, and will allow for setting the clutch within a tolerance of any fractional size. To provide for a 1/64 in. tolerance, 32 teeth will be required on the clutch.

The fixed position of the clutch is held by an insert sleeve *B*, which is inserted through a bore between the forks, and pressed into the base of the forks. This sleeve holds a screw which locks the two clutch halves together. The screw is reached through the side of the chuck key with a hollow head setscrew wrench. Latch *C* releases when transfer finger *D* is pulled up. When the latch is released, leaf spring *E* snaps the handles up. As the handles rise, they are stopped by arm stop seats *F* coming in contact with insert sleeve *B*. When handle *G* is pushed down, linkage-plunger *H* is drawn open. The arm stop seat of this arm presses against the linkage plunger, which in turn draws down arm *I*. Latch *C* is then snapped shut.

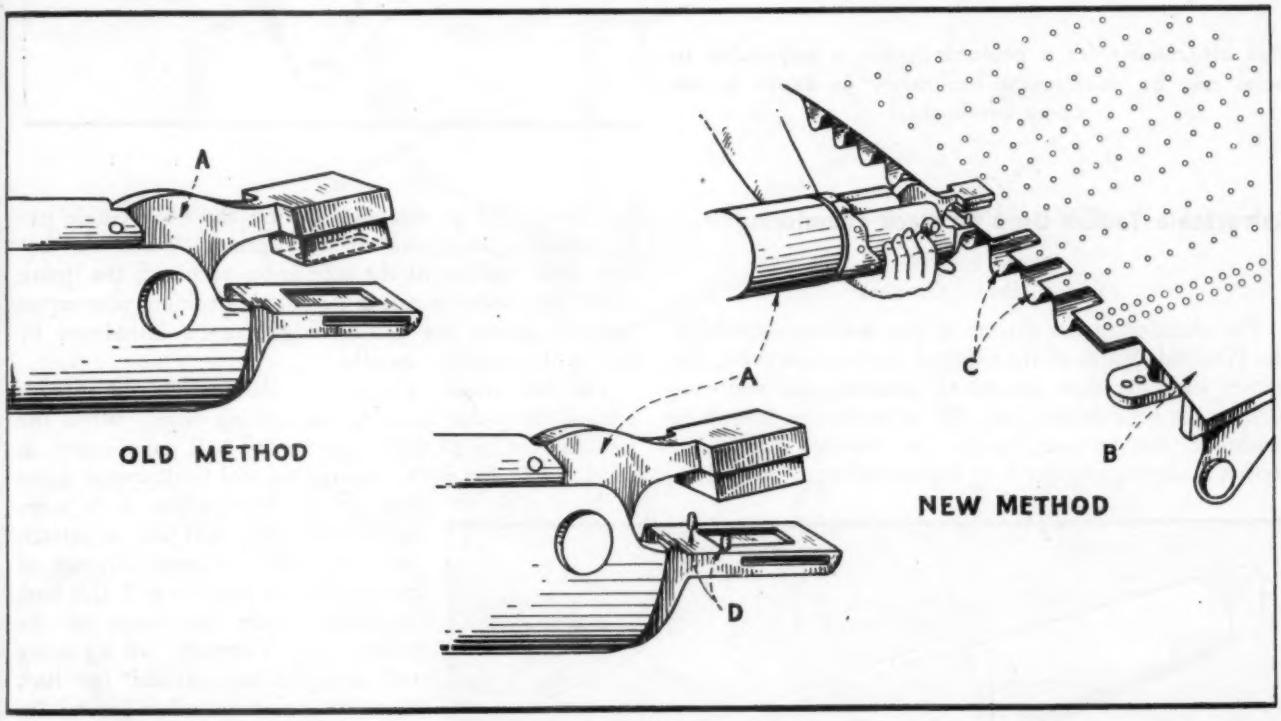
Shaft Fitted With Driving And Locking Keys

BY BENTON S. LARZELERE

Key *A* shown in the drawing is applied to the shaft for locking driving Key *B*. Key *A* is applicable in either direction of rotation, and can be used when the power drive is either through the shaft or through its mating member. Furthermore, the keys do not have to be diametrically opposite as shown in the drawing. It is important that the locking key be applied as shown in the drawing; otherwise, the drive will be through the locking key. The key has been applied to a power unit, the driving key of which, for design reasons, had to be a loose fit. Dimensions of the locking key used are shown in the drawing. Three setscrews *C* were used.



When shaft keys have to be a loose fit, this locking key can be used to prevent backlash



Stop pins fitted in the lower jaw of a squeeze cut-out locates the tool for making accurate indentations above corrugations in airplane wings

Cut-Out Squeezer Fitted With Stop Gage

BY JOSEPH PASZOWSKI
Murray Corporation of America

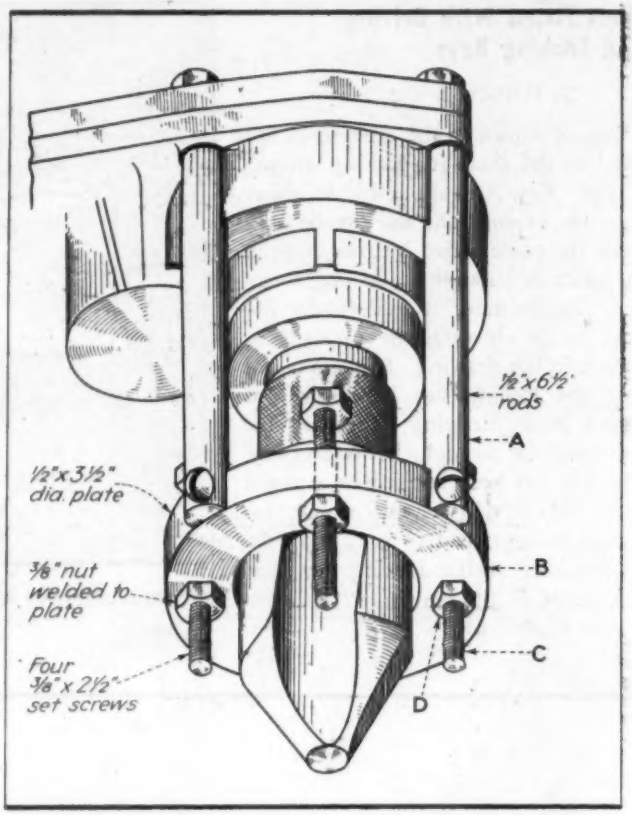
Squeeze cut-out tool *A* is used to perforate skin *B* over corrugation valley *C* on airplane wings. Frequently, the jaws of the tool will be inserted too far, resulting in too deep an indentation. This is now avoided by fitting pins *D* in the lower jaw of the squeezer, the pins acting as a stop when set against the edge of the skin.

Knowing that this tool will perform an acceptable operation, the operator is able to concentrate on performing a cleaner and faster job. Aside from this, the tool fitted with stop pins prevents material damage, and provides more positive cutting action. *War Winning Suggestions from the Board for Individual Awards, War Production Drive.*

Portable Motor Has Adjustable Countersink

BY R. C. DAVIS
St. Johns River Shipbuilding Company

When holes for flat-head rivets or plug welding are countersunk in plates or structural members with a portable motor, considerable time is consumed in countersinking to correct depth, the tool being removed frequently to check the hole. This time-consuming practice can be eliminated with the aid of the adjustable countersinking attachment shown in the drawing. Four arms *A* are screwed into the body of the portable motor after removing the necessary head bolts. Ring *B*, fitted to arms *A*, are drilled to receive adjusting screws *C*. Nuts *D* are welded to the underside of ring *B*. When the adjusting screws are set to give the required depth of countersink, the tool is placed in the drilled hole, which can then be countersunk accurately to depth in a single pass of the tool. No flat-head rivets, driven after countersinking with this tool, have been rejected because of heads not being flush with the plates. The use of this tool has cut time for countersinking to one-half of that previously required. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



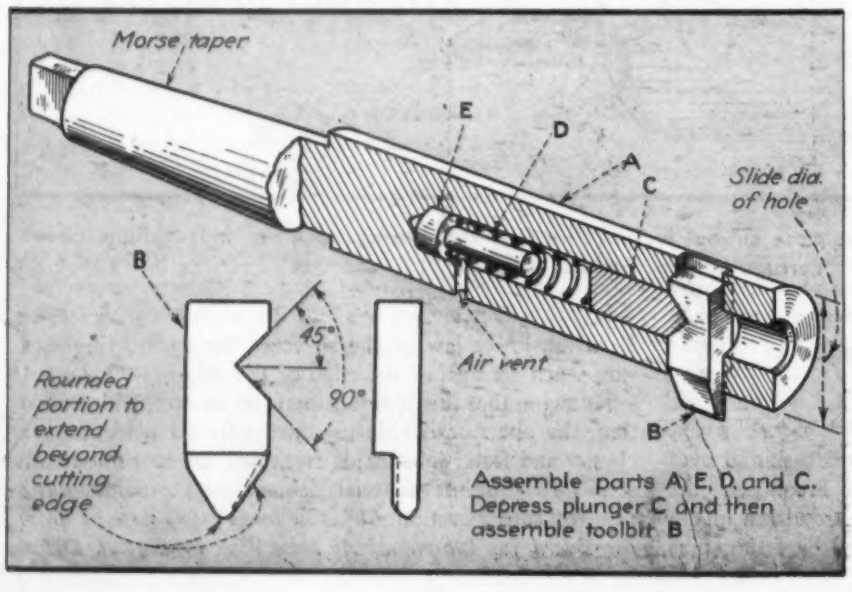
This attachment for a portable motor is adjustable so holes can be countersunk accurately to depth in one pass of the tool

Retractable Toolbit Used for Back Chamfering

BY A. B. SLYE
General Electric Company

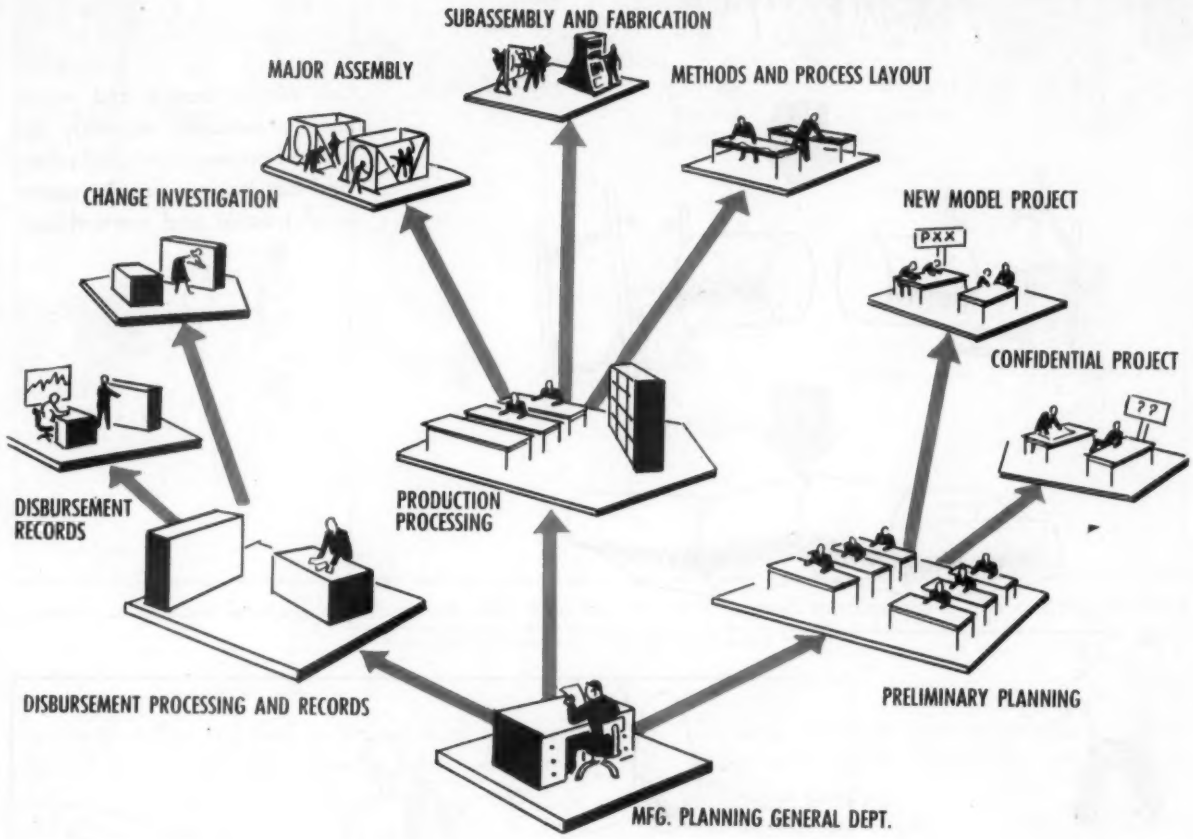
The chamfering bar shown in the drawing, devised at the Pittsfield Works of the General Electric Company, dispenses with the slow process of inserting and removing a cutter for back chamfering. Bar *A* enters the hole to be machined, the pressure against the rounded portion of toolbit *B* causing plunger *C* to depress spring *D* and allowing the toolbit to disappear within the bar. Guide pin *E* maintains alignment of the spring. When the bar emerges at the end of the hole to be machined, the spring causes the toolbit to regain its normal position, whereupon pressure against the cutting edge can be introduced by raising the machine spindle.

The ball shape or radius of the toolbit end extends around the point down to the cutting edge. When the tool has cut to its full capacity, this ball point comes in contact with the work, causing the tool to disappear again into the bar, whereupon it is withdrawn. A quick pull aids in retracting the cutter. Various degrees of chamfering are possible with this tool, depending upon the shape of the toolbit used. Currently, we are using two toolbits, one ground for back chamfering and the other ground for both front and back chamfering. When setting up the bar, guide pin *E*, spring *D*, and plunger *C* are first assembled in bar *A*. Then plunger *C* is degressed in order to assemble toolbit *B*.



When this bar is inserted into a hole for back chamfering, the toolbit disappears in the bar, eliminating the necessity of inserting and removing the toolbit for each operation

Armament
(SECTION OF AMERICAN MACHINIST



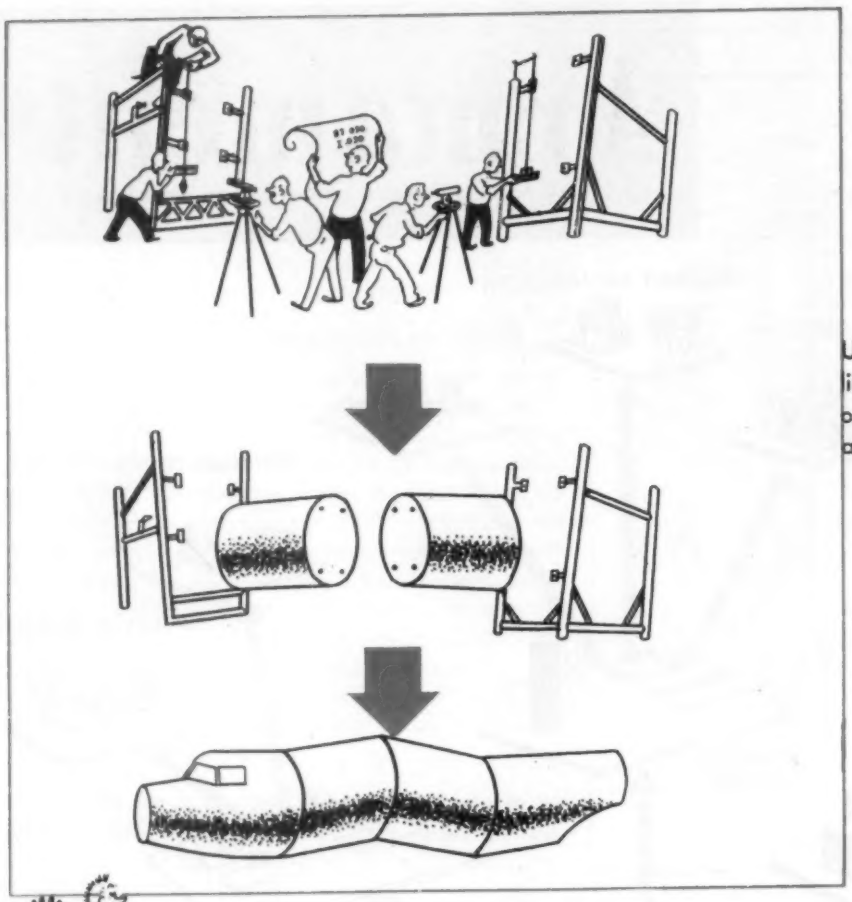
Four War Years Mark Great Strides In Aircraft Manufacture

BY R. A. TRUMPIS, Executive Assistant to Director of Manufacturing Development, Lockheed Aircraft Corporation

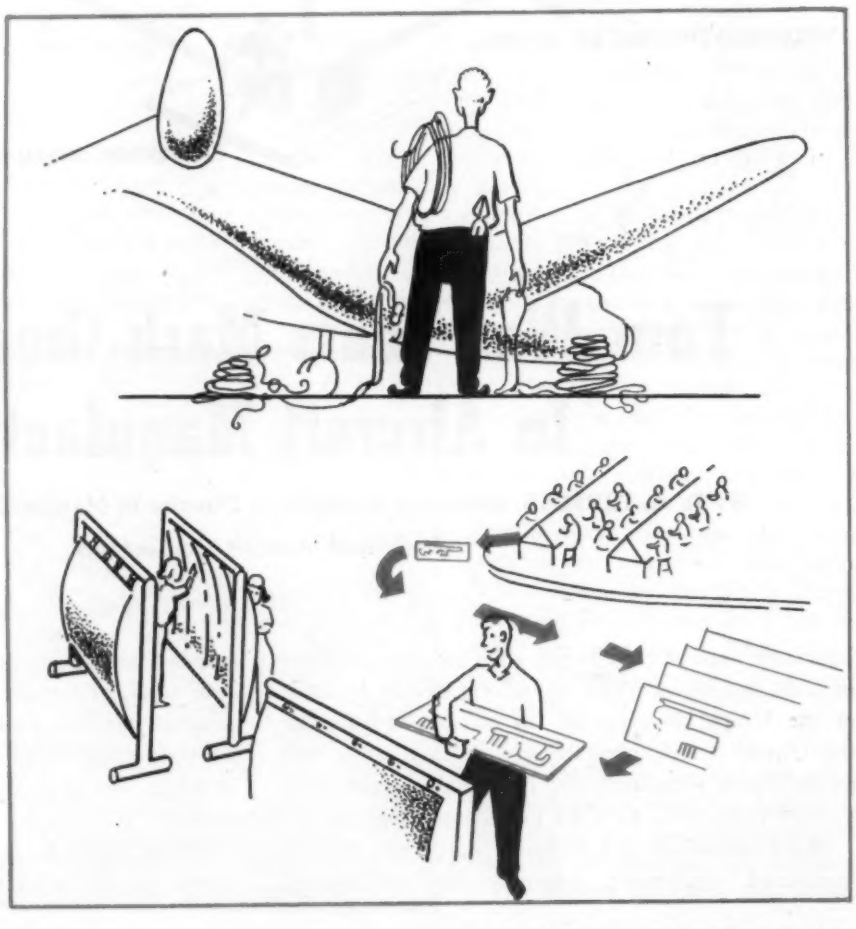
AIRCRAFT PRODUCTION began with tailor-made ships in small quantities. With the advent of the demands of the United Nations on the aircraft industry of the United States, plus the greater impetus of this nation's own armament, the picture of aircraft production from 1941 to 1944 has changed rapidly.

Hand operations and technical skills gave way to specialized equipment, assembly line techniques, standardization programs, high-production fabrication tools, and various other improvements in production facilities. Small contracts gave way to large ones requiring techniques aimed to produce aircraft at a high rate of production and at a low cost in man-hours.

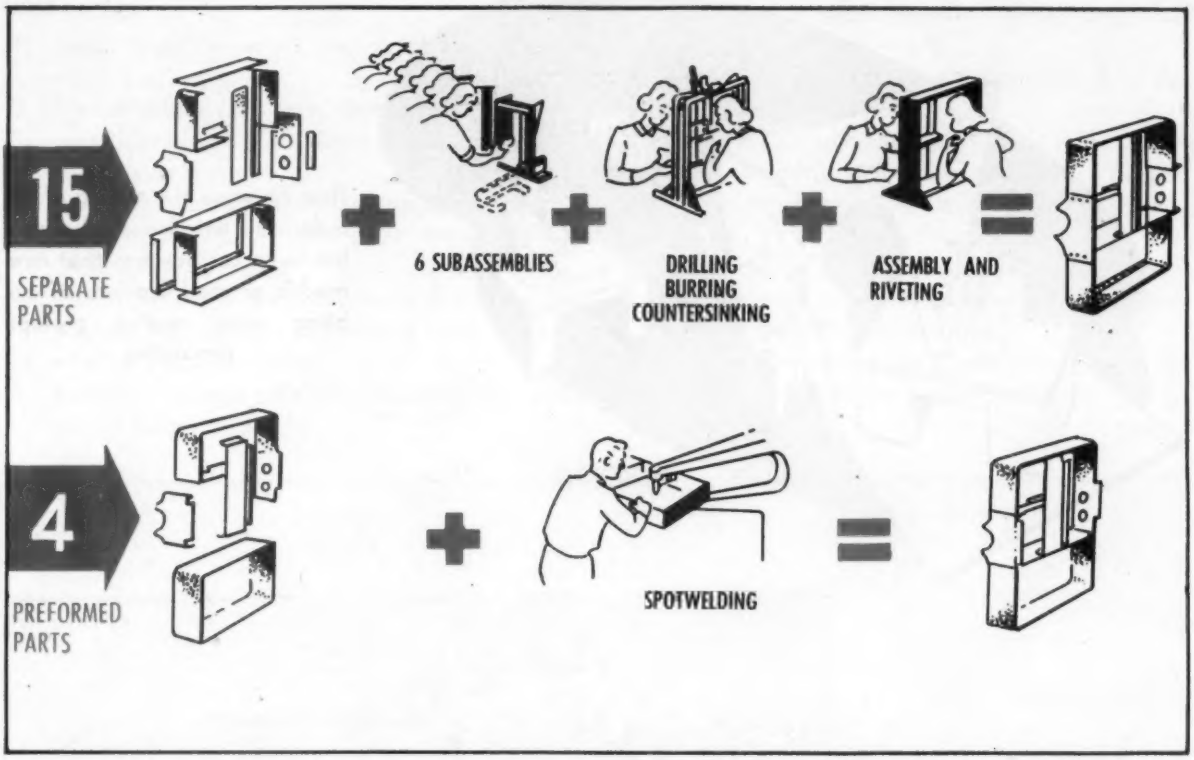
Heavy demands on the aircraft industry for manpower to fill our armed forces has resulted in re-



Use of the transit and plumb line to establish assembly co-ordination was not satisfactory and has been a prolific source of trouble and contention



Inefficient installation of wiring at final assembly has been replaced by installations made at subassembly from preassembled wire boards



Increased use of spot welding has decreased the num ber of parts in small subassemblies and greatly reduced the operations required to fabricate them

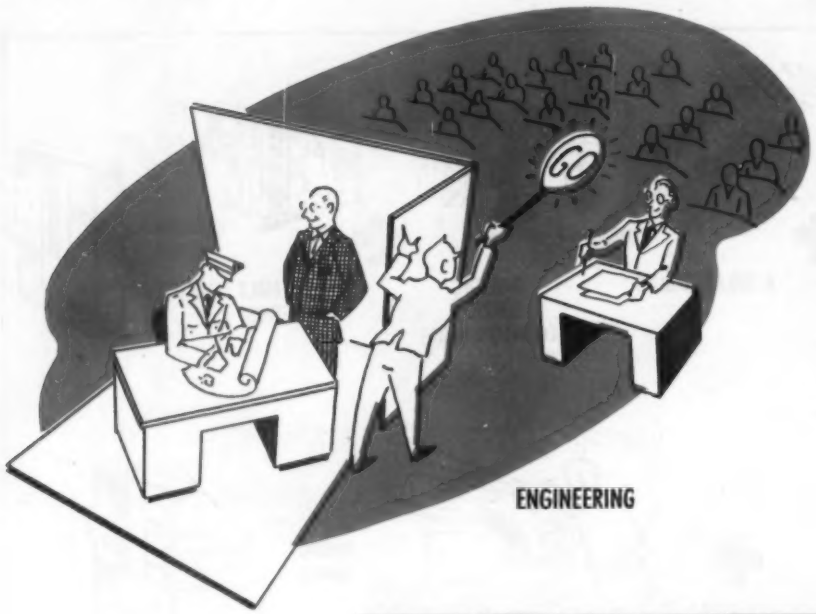
duction of skilled and semi-skilled workers. This has been both from the areas from which aircraft companies have drawn their personnel requirements as well as from their own operating personnel. Radical departures from normally accepted types of production personnel have thus resulted. Female labor, handicapped employables, part-time workers, non-skilled classifications and student labor has been utilized through necessity. Such personnel usage has thrown on the energies and ingenuity of production engineers a huge load of work to plan and devise and build or procure specialized equipment, tools, machines, plus the establishment of manufacturing techniques that would produce comparable output per productive hour without the skill formerly demanded by the industry.

In the year 1941 low production requirements saw utilization of following manufacturing methods and techniques:

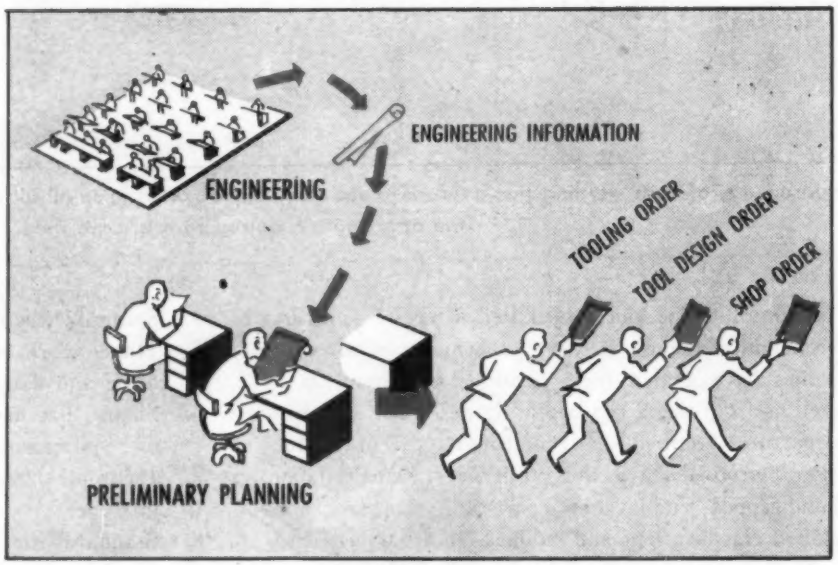
Fabrication

1. Sheet-metal pieces were sheared on large shears disregarding size or tolerance requirements.
2. Formed parts were, for the most part, built on drop hammer tools.
3. Speed hammers were extensively used to smooth out wrinkles.
4. Spinning was used for deep symmetrical shapes.
5. Hand work predominated for trim, burring, filing and flanging.
6. Shaped flat parts were routed for the majority of requirements.
7. Hydropress techniques were crude and limited in scope.
8. Standard die sets were used extensively in punch presses.
9. Formed part trimming was only partially developed for overpressed templet usage with vertical pin routers.
10. Tube bending was done with filled tubes to preserve symmetrical section at the bends. This required cleaning and processing after bending.

A review of production practices from 1941 to 1944 shows how war requirements were achieved and reflects current trends in the plants of airframe manufacturers



Time between the closing of an order and detailed engineering has been cut down so that new models or modifications of existing ones receive prompt processing



Preliminary planning soon results in a flow of orders that initiate the physical preparation for the new model in terms of shop tools

Form block bending was heavily used.

11. Anodizing and priming individual parts were required.
12. Small tube bending for precision requirements was done entirely by hand.

Assembly

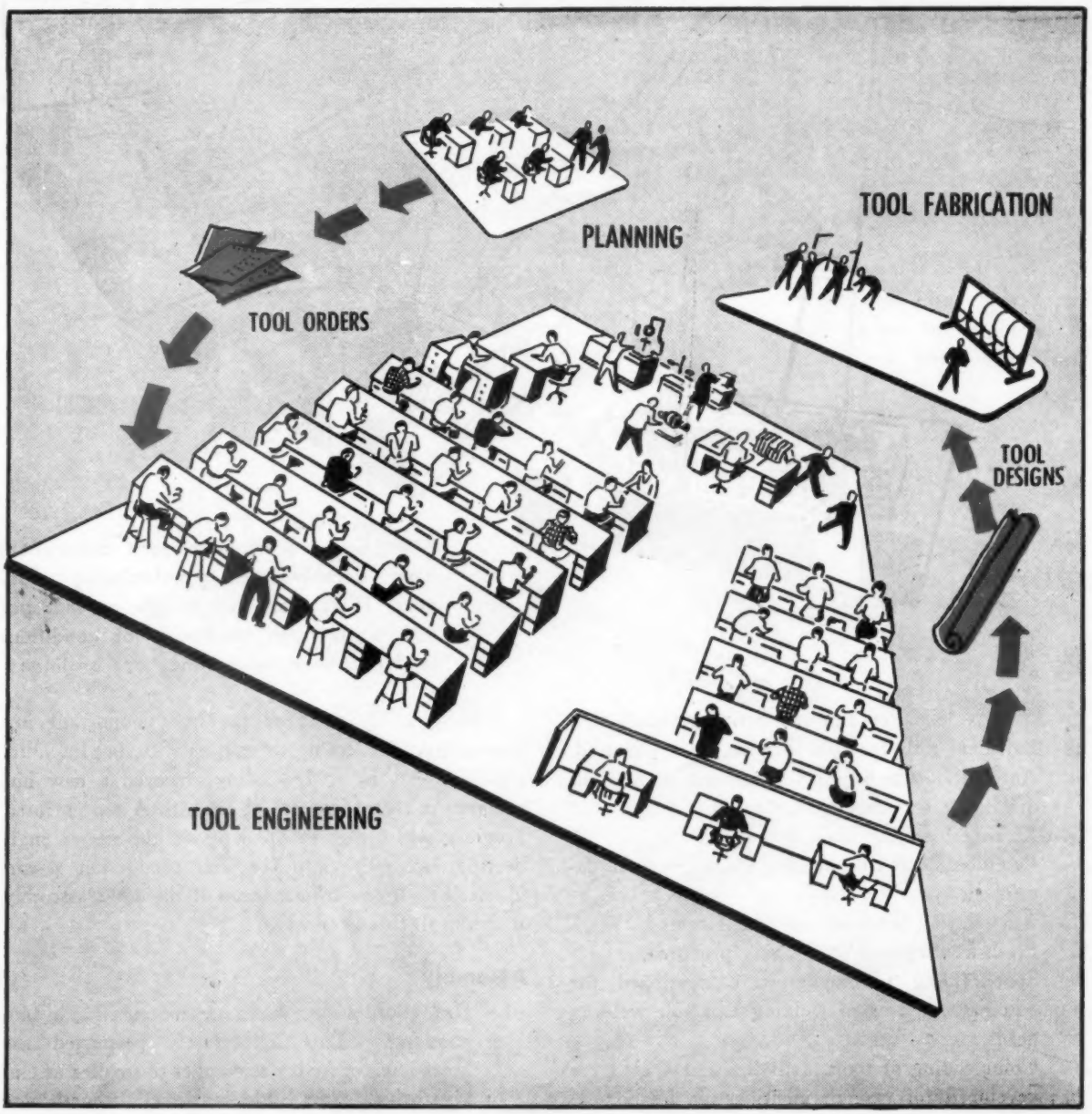
1. Riveting was the major method of joining.
2. Assemblies were large and clumsy and were as close as possible to true engineering assemblies.
3. Assembly policy was "Cut to suit, form to fit."
4. Blueprints were used as only source of information with the operators' "Little Black Books" as added instructions.
5. Operations and personnel were never at the same place twice.
6. Stationization and control of disbursement was not practiced.
7. Functional specialization was paramount.
8. Final assembly was the catch-all of all installations of plumbing, electrical, hydraulics and equipment.
9. Scheduling was in the groping stage.
10. Assembly tools were large, clumsy, overequipped with locators and generally were as difficult to unload as to load.
11. A large proportion of fabrication was performed outside of these jigs.
12. Little or no hole coordination existed, and production assemblies were consequently in an experimental stage.

The year 1942 saw the first steps in the development of techniques, tools and methods necessary to produce more than "one a day" production. Imme-

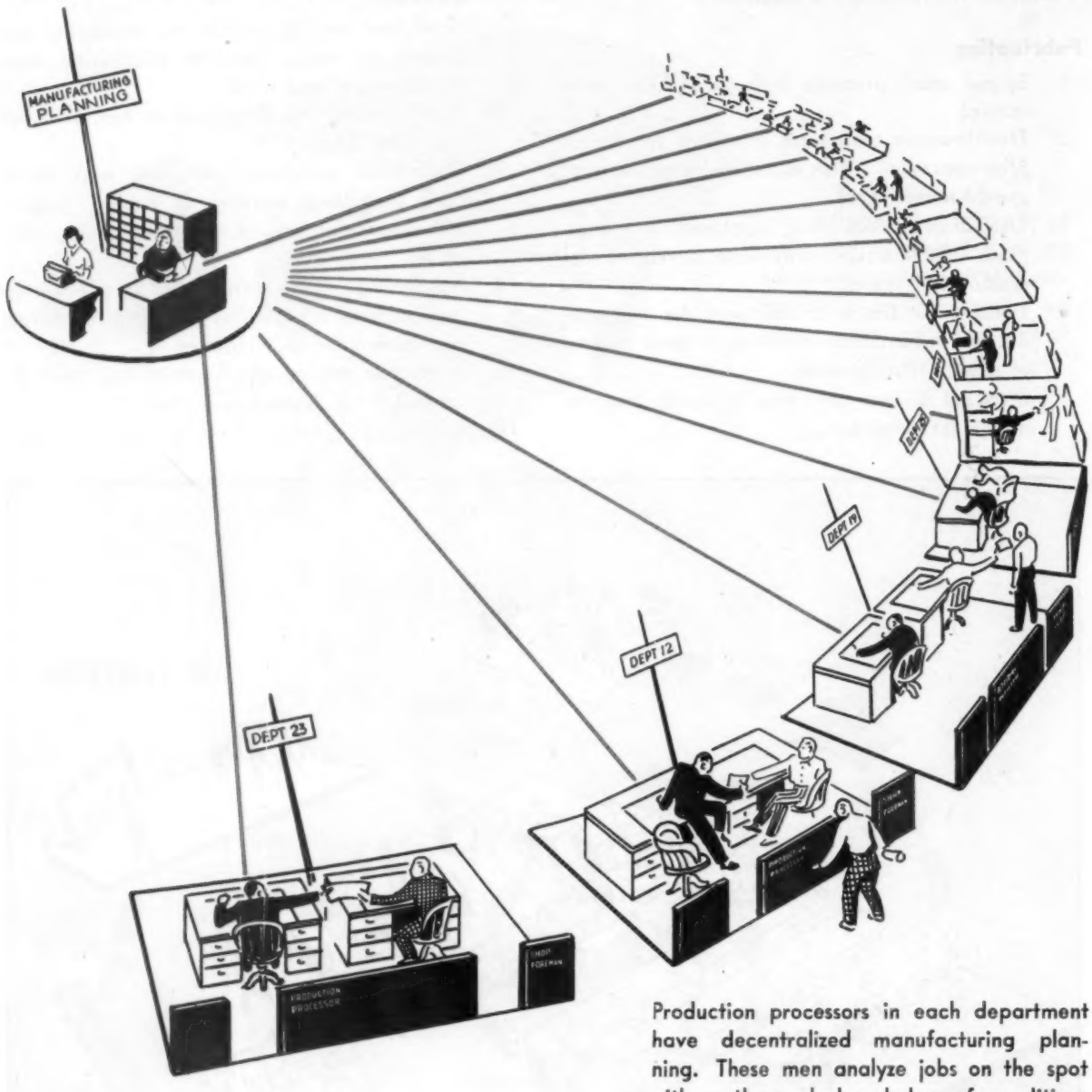
diate inception of production improvements can be seen in the following list of techniques:

Fabrication

1. Special small precision high-speed shears were secured.
2. Double-action tools were developed for hydropress operation. This eliminated a majority of speed-hammer work.
3. Deep-draw presses were purchased, and deep-draw double-action tools were developed for symmetrical shapes.
4. Punch-press dies were developed for high-production requirements reducing a good portion of master routing work.
5. Standard die sets gave way to plastic dies and simple flat metal dies.
6. Extrusion forming tools and equipment were developed.
7. Good heat-treating practice was established and control equipment installed eliminating most straightening hand work.
8. Plastic tooling was developed on dies, drill jigs and form blocks.
9. Hydropress techniques and tools were developed permitting forming of flanges, joggles, and eliminating rework and straightening hand work.
10. Numbering inserts were placed in punch-press tools eliminating much of the extra numbering operations previously required.
11. High-cycle milling and hyper-milling were developed for high-speed operation.
12. Specialized universal tooling was developed



Tool orders are engineered, and soon completed designs flow into the shop or to outside vendors for making



Production processors in each department have decentralized manufacturing planning. These men analyze jobs on the spot with a thorough knowledge of conditions in departments where they are stationed

such as Whistler dies and Strippet punch dies.

13. Farnham rolls for skin forming were procured.
14. Automatic tube-bending equipment with mandrel usage was developed.
15. Kirksite blanking tools were built.
16. Precision small tube-bending machines were developed.
17. Tube-flaring machines were engineered.
18. Flash-welding equipment was procured.
19. Spot-welding techniques were developed for automatic and seam welding and roll welding needs.
20. Color coding of tools, drill jigs and drills were developed for ease of identification by non-experienced personnel.

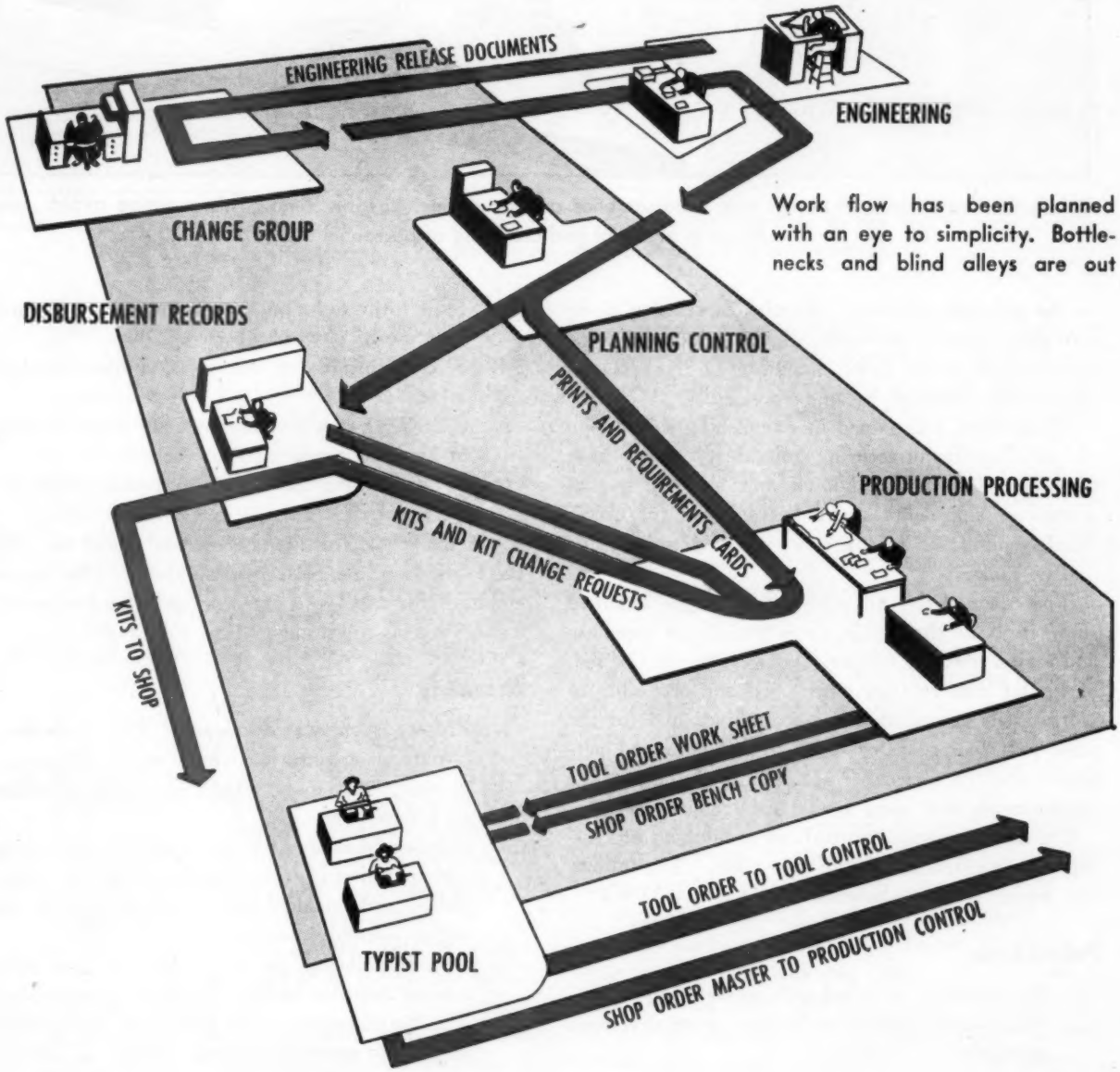
During 1942, some of the most important improvements in assembly techniques were begun. During this year, assembly tooling achieved a new importance in the production of aircraft. A concentrated program was begun to break down the major engineering assemblies into the first production assemblies. The following are some of the 1942 assembly activities started in this year:

Assembly

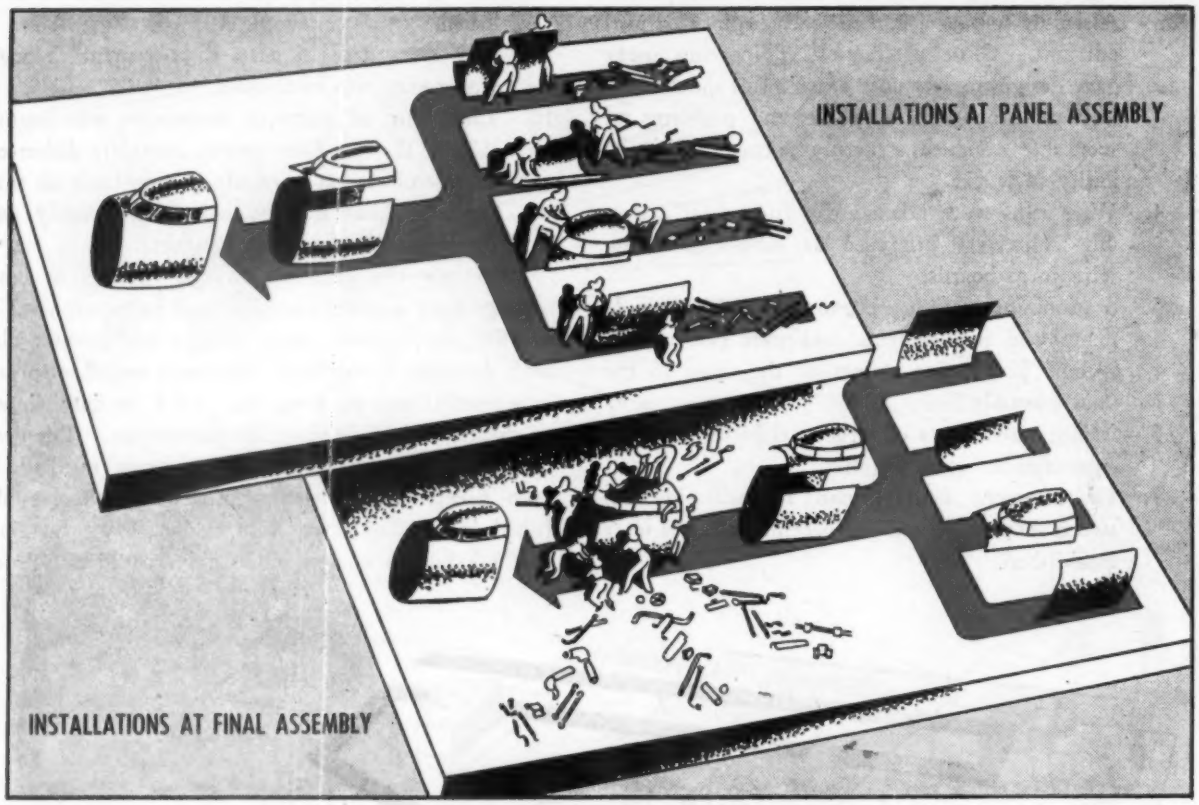
1. Hole coordination was a paramount issue in tool planning. This immediately permitted the breakdown of major assemblies to smaller assemblies which later could be brought together to form a major subassembly unit.

2. Tool masters were extensively used establishing interchangeability at critical joining points.
3. Assembly tooling began to reach engineered proportions. Close production engineering study gave design departments problems of quick loading and unloading to solve and problems of workable designed structure permitting accessibility to work.
4. Wire runs were taken away from final assembly and were produced as subassemblies on wire form boards.
5. Stationizing activity began establishing crude manpower requirements and part call-outs at specific progression points of the ships in the final assembly line.
6. Minor movements of structural installations to subassemblies were begun.
7. Disbursement control and reconciliation between shop usage and engineering call-outs were established.
8. Scheduling by set-back from door and carried through to component fabrication was established.
9. The kit system of parts disbursement through stockrooms was established.
10. Line flow of parts to assemblies was begun. Under the line flow system, parts are disbursed to assemblies on a regular usage basis so that the assemblies may be built continuously day by day to the line requirements.

1943 saw the greatest physical changes in both tooling, floor layouts, methods and fabrication. Up to 1943 the momentum of greater and greater aircraft demands by the Army and Navy began to spread in a general over-all program. 1944, to date, shows no evidence of slackening this momentum. The general over-all assembly tooling program resulted in even greater breakdown of assemblies than established in 1942. It was also evidenced at this time that breakdown on assemblies alone could not result



Work flow has been planned with an eye to simplicity. Bottlenecks and blind alleys are out



Installations are made in panels and subassemblies at the earliest possible time. This practice avoids confusion in material and crowding of personnel

in the ultimate efficiency. Results, in relation to establishing small, workable, lightweight assemblies, suitable for female labor, handicapped workers and school boys, however, became a possibility.

Momentum was gained in establishing ship design to facilitate manufacturing suitability. This gave clean-cut airplane breakdown and assemblies, subassemblies and detail assemblies suitable for quick, simple tooling and for the new type of personnel filling the ranks.

The effect of this pre-planning technique began to show itself in the design developments of assembly and major assembly tooling. Jigs were better stressed, of lighter construction, more open and accessible to work, easily coordinated and maintained and for the most part foolproof for usage by inexperienced personnel and that personnel not capable of the physical requirements that were available in months past.

During this period, centralized production processing was decentralized to the shop areas. The following major accomplishments were made in 1943:

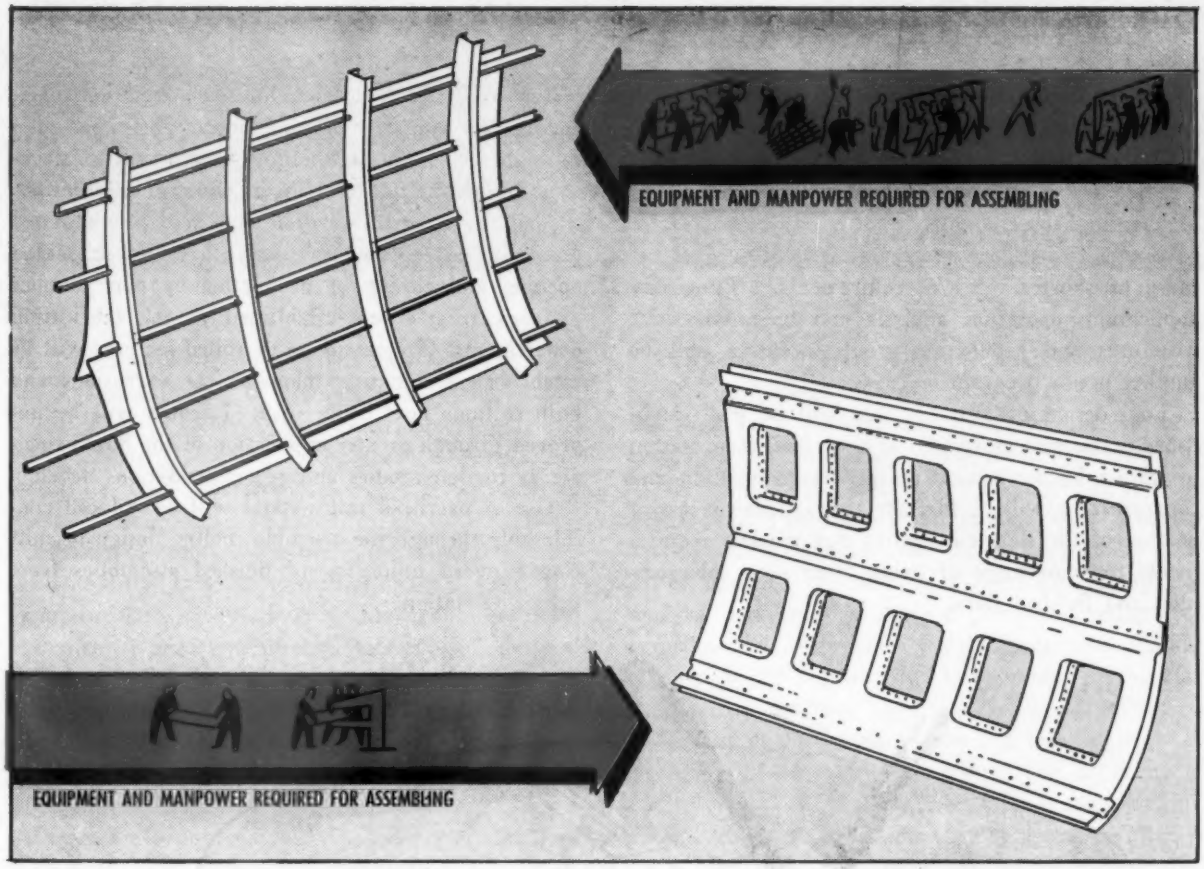
Fabrication

1. Development of rolled sections were begun.
2. Multi-spot welding techniques were developed partially.
3. Skin form techniques were engineered permitting use of power rolls.
4. Stretch forming of skins was another development.
5. Cam benders were developed for form bending of extrusions and stringer sections.
6. Wrap forming techniques for forming contours were started.

On the whole, little emphasis was placed in 1943 on fabrication methods or techniques. The major emphasis for 1943 was on development of assembly tooling and assembly methods as follows:

Assembly

1. Process layout was developed. This made floor layouts an engineering science where placement of equipment, tools, stands and racks are made on a flow basis.
2. Subassemblies of the major assembly outer wing jigs permitted greater applications of semi-skilled and female labor on breakdowns of the major assembly outer wing.
3. Barrel sections of the multi-motored plane were broken down to panels and open subassemblies. The barrel sections were placed on rails permitting easy movements from station to station.



Improved airframe design has simplified manufacturing problems. An example is the use of interpressed skin construction to eliminate the use of stringers and circumferentials

4. Self-loading monorail jigs were established permitting movement of assemblies from jig to jig eliminating need for strong personnel.
5. Stationizing and assembly movement with balanced labor was installed.
6. Maximum application of man-hours per each elapsed manufacturing hour was started.
7. Short multiple assembly lines were developed conserving floor space.
8. The mechanical wing line was developed and mechanized.
9. Automatic riveting of Erco panels establishing maximum amount of uniformity of sections was started extensively. This eliminated requirements for many skilled riveters.
10. Subassembly installations were developed to a major extent. This permitted break up of functional skill requirements and permitted female and semi-skilled help to make these installations.
11. Photo tracing, illustrations, and other types of visual instruction sheets were started.
12. Studies and recommendations were completed to permit one shift operation for present schedule requirements.
13. Experienced processors were procured and work was started to record each operation and sequence. From this basic data, time values were developed and balanced operations in ship movements are progressing. This is preliminary to establishment of possible productive group incentives.
14. Many counter-balancing devices have been established to eliminate lifting of heavy tools so that women operators could cover more work than previously possible. Typical of this is the alligator type of squeezer.

In many respects, 1944 will be a banner year in manufacturing methods. Plans and programs started in 1944 will show many radical departures from the past methods of operation due to expected increased demands in output as well as through developments incorporated into the new models coming into being.

Of primary importance will be the full establishment of subassembly installation work into the breakdown assemblies. Such subassembly installation will see electrical, plumbing, hydraulic and general equipment installed in the major units prior to mating of these units. This will mean that major sections of final assembly area, now occupied by fuselage fore and aft sections, will be eliminated because the work performed in these stations will be in subassembly

structure work. In-process inventories of ships in semi-complete stage will be reduced drastically.

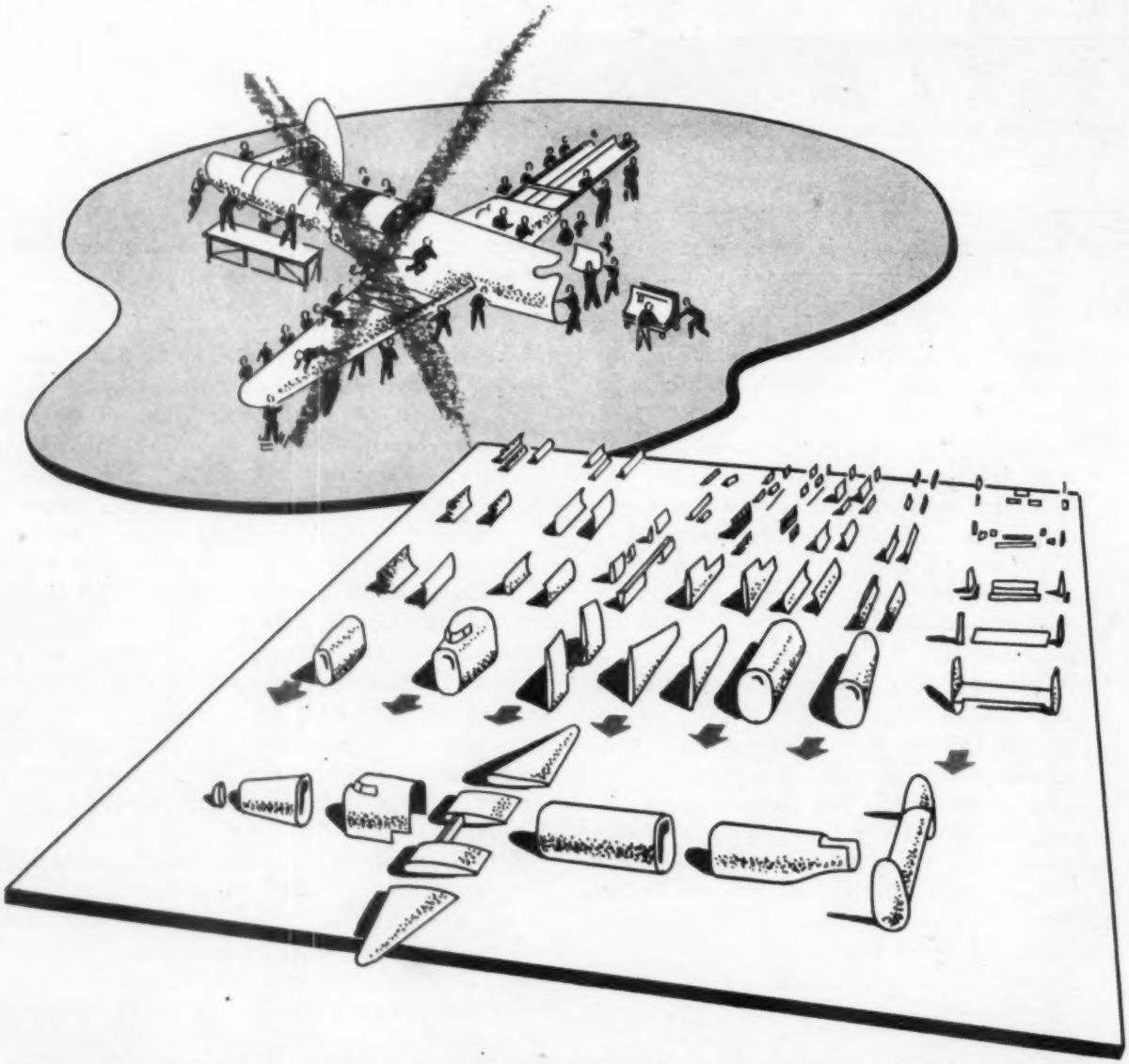
Changes will become easier to plan and schedule because they will be incorporated in the earlier stages of the ship construction. Scheduling of parts and government-furnished equipment will be simpler because of shorter setback requirements. Timestudy application, operation analysis and operation sheet structures and productive group incentive will be another major program in 1944.

Tool design of assembly jigs will be well established permitting movement of assemblies from station to station by mechanical means. Mechanization and conveyorizing will be in force throughout the major portion of the shop eliminating heavy labor requirements for movement of parts, assemblies, subassemblies and finished ships.

The designs will be incorporated in relation to reducing the number of component parts per ship through such means as the interpressed skin construction eliminating use of stringers and circumferentials.

Shop orders for fabrication parts will be eliminated and will be replaced by parts lists and scheduled opening and closing of production by part number and operation sheets established in the fabrication departments. Greater usage of rolled sections will be established eliminating many of the extrusions and bulb sections now being used. Layouts will be improved through greater application of the flow principle as further studies and recommendations develop.

Use of overhead rail systems will be reduced considerably through the assembly tooling design permitting forward unloading of finished assemblies from station to station.



Mass production depends on the coordinated assembly of small units, an objective achieved by close cooperation between design and manufacturing engineers

An Aircraft Plant Fits Workers to Jobs Through Examination of Each

BY COORDINATING job evaluation and thorough physical examination of applicants, a large Atlantic Coast aircraft factory prevents placement of physically deficient workers in occupations that might aggravate their shortcomings or cause danger to others.

Surveys of each job determine the physical abilities necessary for satisfactory performance. They also ascertain the worker-ailments that would preclude placement in each type of employment. For instance, indivduals blind in one eye should not be placed as crane operators, for they generally have little depth perception. Individuals with dizzy spells due to high blood pressure, menopause, or other cause, should not work on high ladders or temporary scaffolding. Those with eczema should not be placed on jobs involving the use of solutions irritating to the skin.

Three basic considerations, aside from the training and ability of the applicant guide the medical department in passing on his fitness for placement:

1. What effect will the job have on the man? Will it aggravate a physical condition? Is it of too exciting a nature—too noisy, too fast—for his neuropsychiatric balance?

2. What would be the effect of this man on those with whom he would work? Does he have a contagious disease, as malaria or tuberculosis? Is he subject to fainting spells that might cause him suddenly to lose control of hazardous machinery?

3. Would his employment represent a threat to company equipment or work in process?

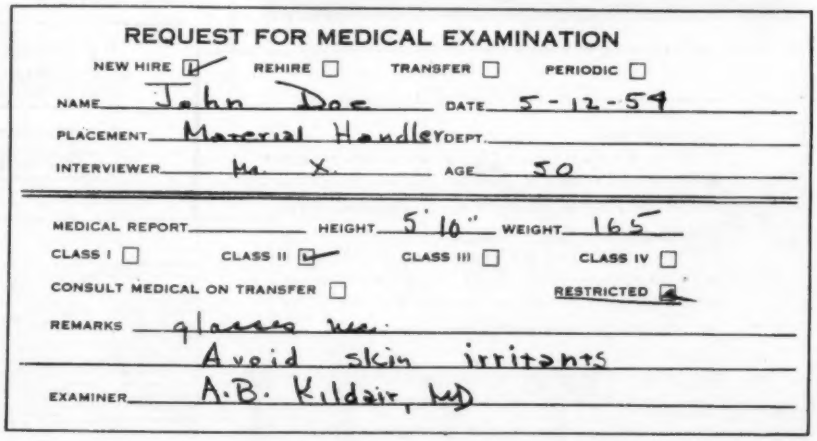
Preliminary interviews by the employment department almost completely disregard the fine details of an applicant's physical condition; to uncover and evaluate these is the work of the medical department. With consideration mainly for his training and inherent ability, the interviewer indicates on a "Request for Medical Examination" the placement he considers proper. He will have been guided by the analysis that has been made of each job, taking recognition that a six-footer cannot buck rivets inside a wing, while a 5-ft. 2-in. 240-pounder belongs on a floor-level job, not on a ladder. The interviewer principally evaluates knowledge and training.

When the interview is finished, the applicant is ready for physical examination. This is complete, including chest x-rays to discover tuberculosis or silicosis, laboratory analyses to disclose venereal diseases, diabetes or various communicable parasites, occasionally in selected cases electro-cardiograms to determine heart conditions, as well as evaluation of height, weight, vision and "healthfulness."

When all of these examinations are completed and the facts gathered, the applicant is placed in Class I, II, III or IV. To be placed in Class I, he must have no mental or physical defects and be eligible—in so far as his body and psychological balance are concerned—for assignment to any job in the plant.

Assignment to Class II is made in the instances of those who have certain shortcomings, some of which may be overcome, and which do not interfere with efficient performance in any placement.

Upon finding that an applicant's training and experience qualify him for a particular job, the employment department requests a physical examination. On the outcome of this, the medical department determines his physical and mental ability to do the work indicated



REQUEST FOR MEDICAL EXAMINATION

NEW HIRE ☑ REHIRE ☐ TRANSFER ☐ PERIODIC ☐

NAME John Doe DATE 5-12-54

PLACEMENT Material Handler DEPT.

INTERVIEWER Mr. X. AGE 50

MEDICAL REPORT HEIGHT 5'10" WEIGHT 165

CLASS I ☐ CLASS II ☑ CLASS III ☐ CLASS IV ☐

CONSULT MEDICAL ON TRANSFER ☐ RESTRICTED ☑

REMARKS glasses req.
Avoid skin irritants

EXAMINER A.B. Kildair, MD

Those placed in Class III possess hazardous abnormalties, but not so great as to preclude qualification for the job. While they do not pass physical examination, they can probably do the job called for, but liability is involved in employing them. Their defects must be overcome with treatments before they may be employed. Wherever possible, the applicant so classified may be employed if he regularly undergoes treatments, or corrects the defect.

An instance of this would be a person with diabetes: on his medical report to the interviewer would be written, "have his family physican communicate with us"; if the applicant does contact his physician and ask him to get in touch with the plant's medical department, the findings of the examination are made known to him. Then the applicant may start treatments and if he keeps them up, and if they are effective, and every six weeks presents proof thereof, the objection is removed and he may be hired.

When proof of cure is presented, the medical department will transfer the applicant to Class II. As long as he is in Class I, II or III, he may be employed. If he lapses in taking treatments, he will be placed in Class IV and must be discharged.

In Class IV are placed applicants whose physical or mental condition makes them a threat not only to themselves but to their fellow employees. Into this group would fall those with active syphilis, tuberculosis, contagious skin diseases or diseases of such severity that disabling illness is imminent.

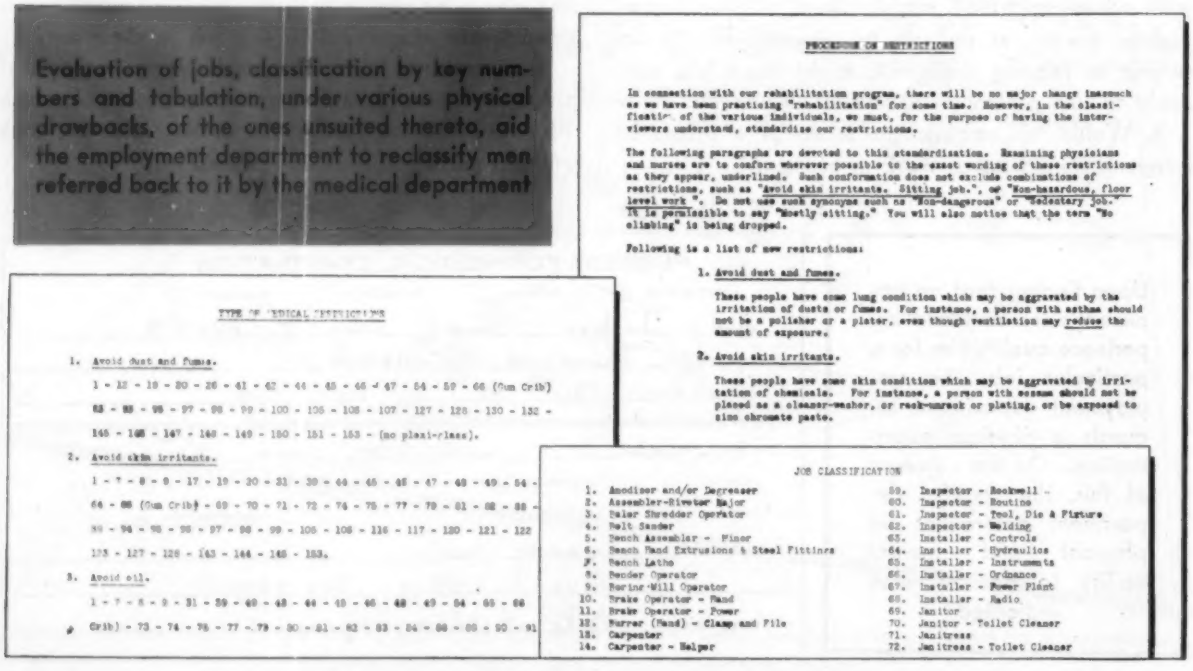
Static disabilities, as leg or spine deformities, are not placed in Class IV. People with such as these will be marked for Class II and hiring encouraged, even though they do not pass the physical examination.

The personality of a person with a deformity will influence his classification in group III or IV; if his defect has him licked, has him convinced that he can't do a good job even though given the opportunity, he will be placed in Class IV and not employed.

In Class IV are placed applicants whose physical or mental condition makes them wholly unsuitable for the placement indicated. A man whom the employment department had thought to hire as a material handler—a job requiring heavy lifting—might be found to have a hernia. This would disqualify him for that job and result in placement in Class IV. But the employment department would reconsider his case, in view of the findings of the medical department and place him in some less strenuous job, as that of tool crib attendant. When this new placement came through to the medical department, the worker—barring other complicating factors—might be moved to Class II with the express proviso that he must wear a truss until such time as he may have the hernia repaired. His record would be marked to indicate that his field of work is restricted.

To facilitate the work of the employment and medical departments in placing men with regard to their infirmities, not only has each job been surveyed and its needs described, but each has been numbered consecutively. These key numbers are colated on another form under such restrictions as "Avoid Heavy Lifting," "Avoid Dust and Fumes" and "Avoid Extensive Walking." Under each would appear the key number of the jobs that must *not* be performed by a person whose defect might be aggravated.

Evaluation of jobs, classification by key numbers and tabulation, under various physical drawbacks, of the ones unsuited thereto, aid the employment department to reclassify men referred back to it by the medical department



PROCEDURE ON RESTRICTIONS

In connection with our rehabilitation program, there will be no major change inasmuch as we have been practicing "rehabilitation" for some time. However, in the classification of the various individuals, we must, for the purpose of having the interviewers understand, standardize our restrictions.

The following paragraphs are devoted to this standardization. Examining physicians and nurses are to conform wherever possible to the exact wording of these restrictions as they appear, underlined. Such conformation does not exclude combinations of restrictions, such as "Avoid skin irritants. Sitting job.", or "Non-hazardous, floor level work". Do not use such synonyms such as "Non-dangerous" or "Sedentary job." It is permissible to say "Mostly sitting." You will also notice that the term "No climbing" is being dropped.

Following is a list of new restrictions:

1. Avoid dust and fumes.

These people have some lung condition which may be aggravated by the irritation of dusts or fumes. For instance, a person with asthma should not be a polisher or a plater, even though ventilation may reduce the amount of exposure.

2. Avoid skin irritants.

These people have some skin condition which may be aggravated by irritation of chemicals. For instance, a person with eczema should not be placed as a cleaner-washer, or rack-unrack or plating, or be exposed to zinc chromate paste.

TYPE OF MEDICAL RESTRICTION

1. Avoid dust and fumes.

1 - 12 - 19 - 20 - 26 - 41 - 42 - 44 - 45 - 46 - 47 - 54 - 59 - 66 (Gum Crib)

68 - 89 - 95 - 97 - 98 - 99 - 100 - 105 - 106 - 107 - 127 - 128 - 130 - 132 -

145 - 146 - 147 - 148 - 149 - 150 - 151 - 153 - (no plexi-glass).

2. Avoid skin irritants.

1 - 7 - 8 - 9 - 17 - 19 - 20 - 31 - 39 - 44 - 45 - 46 - 47 - 48 - 49 - 54 -

64 - 66 (Gum Crib) - 69 - 70 - 71 - 72 - 74 - 75 - 77 - 78 - 81 - 88 - 88 -

89 - 94 - 95 - 96 - 97 - 98 - 99 - 105 - 106 - 116 - 117 - 120 - 121 - 122

123 - 127 - 128 - 143 - 144 - 145 - 153.

3. Avoid oil.

1 - 7 - 8 - 9 - 31 - 39 - 40 - 43 - 44 - 45 - 46 - 48 - 49 - 54 - 65 - 66

Crib) - 73 - 74 - 75 - 77 - 78 - 80 - 81 - 82 - 83 - 84 - 88 - 89 - 90 - 91

JOB CLASSIFICATION

1. Anodizer and/or Degreaser	59. Inspector - Rockwell
2. Assembler-Riveter Major	60. Inspector - Routine
3. Baler Shredder Operator	61. Inspector - Tool, Die & Fixture
4. Belt Sander	62. Inspector - Welding
5. Bench Assembler - Minor	63. Installer - Controls
6. Bench Hand Extrusions & Steel Fittings	64. Installer - Hydraulics
7. Bench Lathe	65. Installer - Instruments
8. Bender Operator	66. Installer - Ordnance
9. Boring-Mill Operator	67. Installer - Power Plant
10. Brake Operator - Hand	68. Installer - Radio
11. Brake Operator - Power	69. Janitor
12. Burrer (Hand) - Clamp and File	70. Janitor - Toilet Cleaner
13. Carpenter	71. Janitress
14. Carpenter - Helper	72. Janitress - Toilet Cleaner

Safe Operation of Mounted Wheels and Points—III

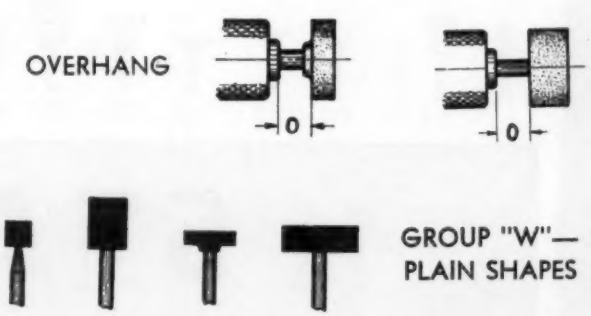
Critical Speeds (r.p.m.) for Mounted Wheels
These are not safe operating speeds — See Part I

GROUP W WHEELS · 3/16 IN. SPINDLES

Shape No.	Wheel Diam. Inches	Wheel Thickness Inches	Overhang—Dimension O				
			3/8"	1"	1 3/8"	2"	2 3/8"
W 158	1/4	1/16	162,000	89,000	64,000	48,000	35,000
W 159	1/4	1/8	150,000	84,000	63,000	46,200	33,500
W 160	1/4	1/4	138,000	80,000	59,000	44,000	32,000
W 161	1/4	1/2	125,000	77,500	57,000	42,500	30,000
W 162	1/4	3/4	119,000	75,000	55,000	40,000	29,000
W 163	1/4	1	105,000	70,000	52,000	38,500	27,500
W 164	1/4	1 1/4	83,000	53,000	40,000	31,000	22,000
W 166	1/2	1/4	158,000	87,000	63,000	47,000	34,000
W 167	1/2	1/2	134,000	78,000	58,000	43,500	31,000
W 168	1/2	3/4	124,000	76,000	56,000	41,000	29,500
W 169	1/2	1	116,500	73,800	54,500	38,500	28,000
W 170	1/2	1/2	102,000	63,000	46,000	34,000	25,000
W 171	1/2	3/4	76,000	50,000	37,000	29,000	21,000
W 173	3/4	1/4	158,000	87,000	62,000	46,000	33,000
W 174	3/4	1/2	131,800	77,000	57,000	43,000	31,000
W 175	3/4	3/4	109,000	67,500	49,000	37,000	27,000
W 176	3/4	1	89,000	57,500	41,800	31,500	23,200
W 177	1	1/4	72,000	48,000	35,000	27,000	20,000
W 178	1	1	56,000	39,000	30,000	23,000	17,200
W 182	1/2	1/4	123,000	75,000	52,500	39,000	29,000
W 183	1/2	1/2	100,000	63,200	44,500	33,200	25,000
W 184	1/2	3/4	77,000	53,000	39,000	29,000	21,000
W 185	1/2	1	66,500	45,000	34,000	26,000	19,500
W 186	1/2	1/4	52,000	37,500	28,500	21,000	16,000
W 187	1/2	1	43,000	31,000	24,500	18,000	14,000
W 188	1/2	1 1/2	30,500	23,500	18,500	15,000	.....
W 189	1/2	2	23,000	18,000	14,000	11,500	.....
W 191	3/4	1/4	111,000	68,500	48,500	36,000	27,000
W 192	3/4	1/2	89,000	58,000	41,000	31,200	24,000
W 193	3/4	3/4	70,000	46,500	34,000	25,000	20,000
W 194	3/4	1	59,200	41,500	31,200	24,000	18,000
W 195	3/4	1/4	46,000	32,000	24,500	19,000	14,000
W 196	3/4	1	34,500	25,200	20,000	15,500	12,500
W 197	3/4	2	19,700	15,700	11,600	9,700	.....
W 200	3/4	1/4	103,000	65,000	45,000	34,000	26,000
W 201	3/4	1/2	79,000	50,000	37,200	28,500	22,000
W 202	3/4	3/4	61,000	42,000	32,500	24,000	18,500
W 203	3/4	1/2	53,000	36,500	27,500	21,200	16,000
W 204	3/4	3/4	39,000	27,000	20,000	16,000	12,500
W 205	3/4	1	33,000	23,000	17,000	14,000	11,500
W 206	3/4	1 1/4	26,000	19,000	15,000	12,000	9,000
W 207	3/4	1 1/2	22,000	16,500	13,000	10,500	.....
W 208	3/4	2	17,000	12,500	10,000	8,000	.....
W 211	1	1/4	97,500	60,000	42,500	32,000	24,500
W 212	1	1/2	72,000	46,000	34,500	26,500	19,500
W 213	1	3/4	56,500	37,500	28,500	22,000	16,500
W 215	1	1/4	93,000	59,000	41,500	31,500	24,000
W 216	1	1/2	68,000	45,000	33,000	25,500	19,000
W 217	1	3/4	52,500	36,000	26,500	21,000	16,000
W 218	1	1	43,700	29,500	22,500	17,200	13,800
W 219	1	1/4	33,500	23,500	17,200	13,200	11,200
W 220	1	1	26,000	19,000	15,000	11,500	9,500
W 221	1	1 1/2	17,500	12,500	9,500	8,000	.....
W 222	1	2	12,000	9,500	7,500	6,500	.....
W 225	1 1/4	1/4	57,400	38,500	28,300	21,700	16,400
W 226	1 1/4	1/2	44,400	29,500	21,800	17,000	13,700
W 227	1 1/4	3/4	37,000	25,500	18,600	14,200	11,600
W 228	1 1/4	1	27,500	19,500	14,700	11,700	9,500
W 229	1 1/4	1	22,000	16,000	11,500	9,200	7,700
W 230	1 1/4	1 1/4	17,700	12,200	9,300	7,600	.....
W 231	1 1/4	1 1/2	13,700	9,700	8,000	6,800	.....
W 232	1 1/4	2	10,000	8,000	6,500	6,000	.....
W 235	1 1/2	1/4	51,500	33,200	25,200	20,200	15,700
W 236	1 1/2	1/2	36,300	25,000	18,500	14,000	11,500
W 237	1 1/2	1	21,000	15,000	10,500	8,500	7,500
W 238	1 1/2	1 1/2	13,200	9,300	7,300	6,500	.....

GROUP W WHEELS · 1/4 IN. SPINDLES

Shape No.	Wheel Diam. Inches	Wheel Thickness Inches	Overhang—Dimension O				
			1/2"	1"	1 1/2"	2"	2 1/2"
W 176	3/4	1/8	108,000	72,500	56,000	44,000	34,000
W 177	3/4	3/4	88,000	62,000	47,000	36,500	28,000
W 178	3/4	1	73,600	54,000	40,000	31,000	23,000
W 179	3/4	1 1/4	61,000	45,000	34,300	26,300	.....
W 182	1/2	1/8	145,000	83,200	61,000	47,200	36,700
W 183	1/2	1/4	111,200	73,000	54,000	41,500	32,000
W 184	1/2	3/8	95,000	63,500	46,700	36,000	27,800
W 185	1/2	1/2	82,000	56,000	42,000	32,000	24,500
W 186	1/2	3/4	68,000	48,500	37,000	28,300	21,500
W 187	1/2	1	54,000	40,000	32,000	25,000	19,000
W 188	1/2	1 1/2	40,500	32,000	25,200	20,000	.....
W 189	1/2	2	32,000	25,000	20,000	16,200	.....
W 190	3/4	1/8	161,500	87,500	64,000	50,000	38,700
W 191	3/4	1/4	135,200	80,000	59,000	46,000	36,000
W 192	3/4	1/2	108,000	69,000	51,200	39,700	31,000
W 193	3/4	3/4	89,500	60,000	44,500	34,500	26,800
W 194	3/4	1/4	75,200	53,000	39,200	30,300	23,200
W 195	3/4	1/2	62,000	43,200	33,200	26,300	20,500
W 196	3/4	1	47,000	36,000	28,400	22,500	17,500
W 197	3/4	2	28,000	22,000	17,200	14,500	.....
W 198	3/4	2 1/2	22,000	17,200	14,500	.....	.....
W 201	1	1/4	106,000	68,700	50,800	38,700	30,000
W 202	1	1/2	86,000	58,800	43,200	33,500	25,800
W 203	1	3/4	73,800	48,500	37,000	29,000	22,500
W 204	1	1	57,000	41,000	31,000	24,000	18,700
W 205	1	1	46,000	34,500	26,000	20,000	16,000
W 206	1	1 1/4	38,300	28,700	22,700	18,000	.....
W 207	1	1 1/2	32,000	24,700	19,500	16,000	.....
W 208	1	2	25,000	20,500	16,000	13,200	.....
W 209	1	2 1/2	20,000	16,200	14,000	.....	.....
W 211	1 1/4	1/4	130,000	80,000	57,200	44,000	35,000
W 212	1 1/4	1/2	99,000	63,000	46,800	36,800	28,500
W 213	1 1/4	3/4	81,500	54,500	39,200	31,200	24,500
W 215	1	1/4	126,000	78,500	58,000	45,000	34,000
W 216	1	1/2	95,200	61,000	45,000	35,000	27,000
W 217	1	3/4	76,000	51,000	38,000	30,000	23,200
W 218	1	1	64,000	43,700	33,200	26,000	19,800
W 219	1	1/4	46,800	32,700	25,000	20,000	16,000
W 220	1	1	34,000	25,500	21,000	16,500	14,000
W 221	1	1 1/2	25,500	19,500	16,000	14,000	.....
W 222	1	2	21,200	16,500	13,000	11,500	.....
W 223	1	2 1/2	16,500	13,200	11,500	.....	.....
W 225	1 1/4	1/4	86,000	57,200	42,200	32,000	25,000
W 226	1 1/4	1/2	68,200	47,000	35,000	26,800	21,000
W 227	1 1/4	3/4	54,700	39,500	30,200	24,000	18,800
W 228	1 1/4	1	40,700	30,000	23,800	19,000	15,200
W 229	1 1/4	1	32,000	25,000	20,500	16,000	13,200
W 230	1 1/4	1 1/4	27,200	21,200	17,000	14,000	.....
W 231	1 1/4	1 1/2	23,500	18,000	14,200	12,000	.....
W 232	1 1/4	2	19,000	14,200	12,000	10,000	.....
W 235	1 1/2	1/4	67,000	48,500	38,300	30,300	23,500
W 236	1 1/2	1/2	48,200	36,200	29,000	23,000	18,200
W 237	1 1/2	1	30,000	23,500	17,700	14,500	12,700
W 238	1 1/2	1 1/2	20,800	16,000	13,000	11,000	.....



GROUP "W"—
PLAIN SHAPES

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HACKSAWS • METAL CUTTING BANDSAWS • STEEL TAPES

Safe Operation of Mounted Wheels and Points—IV

Critical Speeds (r.p.m.) for Mounted Wheels
These are not safe operating speeds — See Part I

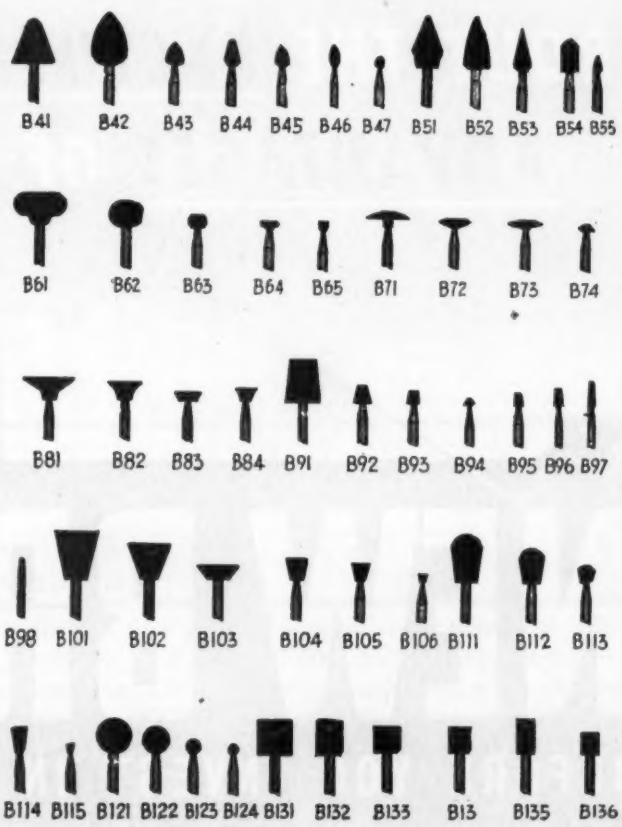
GROUP B WHEELS · 1/8 IN. SPINDLES

Shape No.	Wheel Diam. Inches	Wheel Thickness Inches	Overhang—Dimension O				
			½"	1"	1½"	2"	2½"
B 41	5/16	5/16	45,000	31,000	23,500	18,200	13,800
B 42	1/2	3/4	45,000	31,000	23,500	18,200	13,800
B 43	3/4	1/8	108,500	68,000	45,500	32,000	22,500
B 44	1	3/8	91,200	56,500	38,500	27,800	20,000
B 45	1/8	1/8	139,000	82,500	59,500	41,200	27,000
B 46	1/4	1/8	140,000	86,000	62,200	43,200	28,500
B 47	1/4	1/8	140,000	86,000	62,200	43,200	28,500
B 51	1/8	3/4	60,500	38,000	28,000	21,200	16,200
B 52	3/8	3/4	60,500	38,000	28,000	21,200	16,200
B 53	1/4	5/8	80,000	50,700	35,000	25,000	18,500
B 54	1/4	1/4	80,000	50,700	35,000	25,000	18,500
B 55	3/8	3/4	140,000	86,000	62,200	43,200	28,500
B 61	5/16	1/8	51,000	32,500	23,200	17,700	13,300
B 62	1/2	5/8	54,700	35,200	26,000	20,000	15,200
B 63	3/4	1/8	123,200	76,500	52,500	37,200	25,200
B 64	3/4	1/8	140,000	86,000	62,200	43,200	28,500
B 65	1/4	1/8	140,000	86,000	62,200	43,200	28,500
B 71	5/8	1/8	106,000	64,000	42,000	30,200	22,500
B 72	1/2	1/8	98,000	58,200	38,800	27,700	20,600
B 73	1/2	1/8	98,000	58,200	38,800	27,700	20,600
B 74	1/8	1/8	140,000	86,000	62,200	43,200	28,500
B 81	5/8	1/8	92,000	55,000	37,000	27,200	20,000
B 82	1/2	1/4	108,500	68,000	45,500	32,000	22,500
B 83	5/8	1/2	116,800	71,000	47,000	33,000	23,000
B 84	1/8	1/8	140,000	86,000	62,200	43,200	28,500
B 91	1/2	1/4	46,000	30,000	22,500	17,500	13,200
B 92	1/4	1/4	108,500	68,000	45,500	32,000	22,500
B 93	1/8	1/8	140,000	86,000	62,200	43,200	28,500
B 94	1/16	1/8	140,000	86,000	62,200	43,200	28,500
B 95	1/8	1/8	140,000	86,000	62,200	43,200	28,500
B 96	1/8	1/4	140,000	86,000	62,200	43,200	28,500
B 97	1/8	3/8	140,000	86,000	62,200	43,200	28,500
B 98	1/8	1/4	140,000	86,000	62,200	43,200	28,500
B 101	5/8	1/16	45,000	31,000	23,500	18,200	13,800
B 102	3/8	1/2	60,500	38,000	28,000	21,200	16,200
B 103	5/8	1/8	92,000	55,000	37,000	27,200	20,000
B 104	1/8	3/8	91,200	56,500	38,500	27,800	20,000
B 105	1/4	1/2	139,000	82,500	59,500	41,200	27,000
B 106	1/2	1/16	140,000	86,000	62,200	43,200	28,500
B 111	1/8	1/16	45,000	31,000	23,500	18,200	13,800
B 112	3/8	1/2	60,500	38,000	28,000	21,200	16,200
B 113	1/4	1/4	108,500	68,000	45,500	32,000	22,500
B 114	1/8	3/8	91,200	56,500	38,500	27,800	20,000
B 115	1/8	1/8	140,000	86,000	62,200	43,200	28,500
B 121	1/2	1/2	60,500	38,000	28,000	21,200	16,200
B 122	5/8	5/8	82,200	50,300	36,000	26,500	19,000
B 123	1/8	1/8	139,000	82,500	59,500	41,200	27,000
B 124	1/8	1/8	140,000	86,000	62,200	43,200	28,500
B 131	1/2	1/2	46,000	30,000	22,500	17,500	13,200
B 132	3/4	1/2	60,500	38,000	28,000	21,200	16,200
B 133	3/4	3/4	72,000	44,000	32,200	24,000	18,000
B 134	1/8	3/4	82,200	50,300	36,000	26,500	19,000
B 135	1/4	1/2	80,000	50,700	35,000	25,000	18,500
B 136	1/4	1/8	103,000	61,300	41,200	30,000	21,500

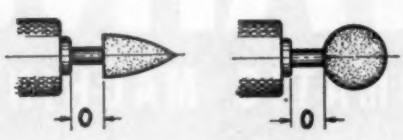
GROUP B WHEELS · 1/4 IN. SPINDLES

Shape No.	Wheel Diam. Inches	Wheel Thickness Inches	Overhang—Dimension O				
			½"	1"	1½"	2"	2½"
B 41	5/16	5/16	88,000	62,000	47,000	36,500	28,000
B 42	1/2	3/4	88,000	62,000	47,000	36,500	28,000
B 51	3/4	3/4	108,000	72,500	56,000	44,000	34,000
B 52	3/8	3/4	108,000	72,500	56,000	44,000	34,000
B 61	5/16	1/8	106,000	68,700	50,800	38,700	30,000
B 62	1/2	5/8	95,000	63,500	46,700	36,000	27,800
B 71	5/8	1/8	161,500	87,500	64,000	50,000	38,700
B 72	1/2	1/8	145,000	83,200	61,000	47,200	36,700
B 73	1/2	1/8	145,000	83,200	61,000	47,200	36,700
B 74	1/8	1/8					
B 91	1/2	1/4	82,000	56,000	42,000	32,000	24,500
B 101	5/8	1/16	88,000	62,000	47,000	36,500	28,000
B 102	3/8	1/2	108,000	72,500	56,000	44,000	34,000
B 111	1/8	1/16	88,000	62,000	47,000	36,500	28,000
B 112	3/8	1/2	108,000	72,500	56,000	44,000	34,000
B 121	1/2	1/2	108,000	72,500	56,000	44,000	34,000
B 131	1/2	1/2	82,000	56,000	42,000	32,000	24,500
B 132	3/4	1/2	108,000	72,500	56,000	44,000	34,000

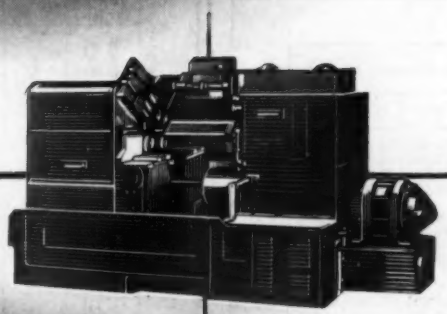
GROUP "B"—STANDARD SHAPES



OVERHANG



★ CHANGING OVER TO BAR STOCK ON A NEW PRODUCT..



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Gaging Business

More and More Shells

The heavy artillery and shell program, which recently was stepped up sharply and given top ranking in priorities, is to be enlarged still further. Additional burdens thus will be imposed upon machine tool builders and steel mills. The big increase in this program, which involves shell and weapons beginning with the 105-mm. and going up to the 240-mm., grows out of the unprecedented expenditure of shell in Italy. The amount of shell used the last few weeks has been the greatest in history, exceeding the volume at any time in 1917-1918. The present program is nearer the one originally figured on, which was cut back after early experience in the war pointed to a much lower use of shell than anticipated.

Tool Demand Rises

Machine tool production is to be sustained at or close to present levels for a number of months. Washington would like to see it expanded to meet more quickly the fresh demands, but many factors such as the manpower shortage militate against an actual rise in the industry's output. It is still estimated that machine tool shipments during 1944 will total $500,000,000 or $175,000,000 more than originally predicted. On top of that the industry will turn out war goods other than machine tools amounting to $150,000,000. Russia probably will buy 15 percent less machine tools during the next protocol year, starting July 1, than during the current year. The total may be around $90,000,000, of which only $30,000,000 is believed to have been placed. This compares with $120,000,000 this year. England will take a relatively small volume of machine tools this year. Though the door is closed to further pool orders, the War Department may place some blanket orders to get things going more quickly to speed the new programs. Some machine tool builders are so deeply involved in subcontract work that they are not in a position to participate much in the new machine tool business. Others, on the other hand, are preparing to pare down their non-machine-tool war operations in order to increase their machine tool production.

Castings, Prime Worries

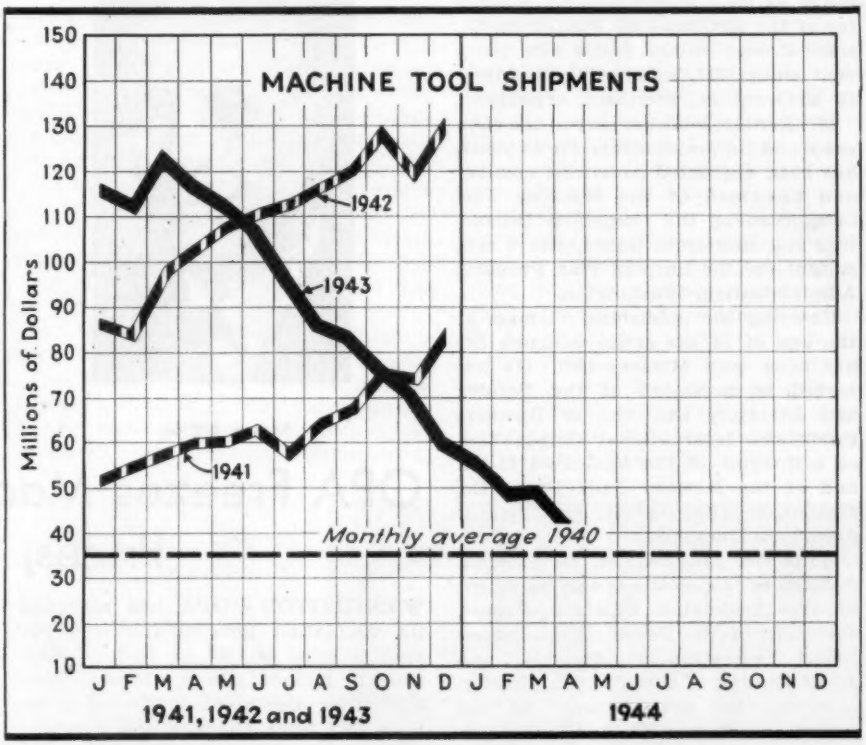
Malleable, some gray iron and small steel castings will be the chief sources of worry in the war program during the summer months. Key foundries now have only 60 percent of the manpower needed. The War Production Board is upset about the inevitable letdown in foundry production during the hot weather when men try to avoid working in temperatures of 100 degrees plus. Manpower shortages probably will ease before the end of the year. But numerous local areas will continue to cause severe headaches. One West Coast area is short 40,000 workers today and must find 30,000 over and above the 40,000 for greatly enlarged projects ahead related to the Pacific campaigns. Steel will continue to be the tightest in the history of the industry, especially with the new shell program at hand. Steel containers for shipment of shell will take more tonnage than the automobile industry used in peacetime.

Schedules Maintained

Landing craft are being built according to schedule, the previous lag having been eliminated. May production was eminently satisfactory. Aircraft is "on time" though the number of planes being completed is less than it was a few months ago. A planned decline in the number of planes produced will affect future production. A new medium tank is reported ready to go into production. Merchant shipbuilding was scheduled to ease off a bit at this time, but instead the pressure is greater than ever. The new maritime load is attributed to a speeding up of plans for the Pacific war.

Components Ease

Communications equipment is being made at an accelerated rate, with no indication ahead of any letdown. The components situation in general is improving; bearings, for example, are not quite so tight. The worst spot is fractional horsepower motors. No real easing looms ahead in the policy to curtail strictly the resumption of civilian goods manufacture. Probably 1,000,000 electric irons will be made this year, but possibility of any passenger cars being built is extremely dim. High Washington officials say that if the manpower problem could be licked, and much of it could be, production of a considerable amount of civilian goods could be started within a very short time. The military electronics equipment program for 1944 is approximately 50 percent above 1943 production.



Down Now, Up Later—A 33.9 percent increase in machine tool orders from March's, $42,264,000 to April's $56,591,000, due to increased demand for new military programs, has not yet affected production, which declined 18.6 percent from March's $51,780,000 to April's preliminary figure of $42,149,000. Cancellations in April were $2,351,000, an increase of 46.3 percent over March. Net new orders in April were $54,240,000, exceeding shipments for the first time since August, 1942

Survey Committee Makes First Available Tool Report

Further data to be sought on availability of idle tools. Industry urges use of own records and sales force. Manpower determines success of new program, says advisory group

WASHINGTON — First reports on WPB's survey of idle government tools showed that 1,935 war plants, about 60 percent of those companies polled, have reported 9,207 modern tools idle and available for transfer. An interagency Machine Tool Utilization Committee with representatives of the military services, Defense Plant Corp., and WPB, has been organized to obtain further data on the availability of idle tools. More than a dozen representative plants are being surveyed by "teams" established by the committee. Industry members urged the use of tool builders' own records and sales forces to locate equipment for specific new needs.

Present machine tool production must be maintained or boosted if a recent estimate of 1944 production, possibly more than $600,000,000, is to be met, WPB officials told the Machine Tool Industry Advisory Committee.

The revised estimate, which includes the existing backlog, is based on tool demands of the vastly expanded heavy artillery and other new military programs. Previous estimate of shipments for 1944 was $485,000,000.

Industry advisory committee members told WPB that manpower held the key to success of the new programs. Not only must current employees be held but new workers must be added to man more fully plants producing critical items. It was emphasized that this should be brought promptly to the attention of Selective Service officials to prevent further decline in face of decreasing orders.

WPB TO PLAN CUTBACKS

WASHINGTON—Charles E. Wilson, executive vice chairman, WPB, will head a new organization to deal with cutbacks and cancellations in the country's military production program and plan for partial industrial reconversion when Germany collapses, according to Donald M. Nelson, WPB chairman.

Under Mr. Wilson in this new panel will be representatives of the Army, the Navy, the Maritime Commission, the War Manpower Commission, and almost all vice chairmen of WPB. This group will recommend to WPB's executive committee "the best possible use of the manpower and the manufacturing facilities which are no longer needed" for war production.

Retires from McGraw-Hill; Assumes CPRB, SWPA Duties

NEW YORK—Mason Britton, a director of the McGraw-Hill Publishing Co. since it was formed and a vice president since 1922, retires July 1, James H. McGraw, Jr., president, announced.

Mr. Britton, who has served the company and its predecessors for 43 years, has been appointed American member and chairman of the Machine Tool Committee of the Combined Production and Resources Board, and a consultant for the Surplus War Property Administration, Washington.

Entering the publishing business at the age of 18, his entire business life has been with McGraw-Hill. He has served as president of the Catalog and Directory Co., and of Business Publishers International Corporation, as a director of the McGraw-Hill Co. and of the Newton Falls Paper Co. For many years he was publisher of American Machinist.

He is vice president of the National Publishers' Association, was president of the Associated Business Papers, chairman of the Board of the Advertising Federation of America, and Audit Bureau of Circulations director.

During the present war, he has served as director of the Tools Division for the Office of Production Management, later WPB, as chairman of the Task Committee of the Printing and Publishing Advisory Committee of the WPB, as treasurer and a member of the Executive Committee of the War Advertising Council, and as a member of the Business Advisory Council, Department of Commerce.

Mason Britton

Strikes Rise with War

WASHINGTON — Each passing war year has seen a rise in strikes, according to the Bureau of Labor Statistics. Man-hours of idleness in the first quarter of 1944 were about twice those of the same three months of 1943.

While the number of new strikes in the first quarter of 1942 was 571, it was 643 in 1943 and 1,020 in 1944. The progression also prevailed in each of the quarters.

There was a somewhat similar progression in the number of workers involved in new strikes. In the first quarter of 1942 there were 154,343 workers involved in new strikes; in the first three months of 1943 there were 203,998, and 340,000 workers went on strike during the first three months of this year.

Strikes during 1943 caused 13,500,529 man-days of idleness.

OPA Freezes Machine Tool Prices; Simplifies Ceilings

WASHINGTON — OPA has extended its regulation governing prices for special sales of idle or frozen materials to include idle machinery, tools and other assembled industrial products. No price changes will result.

Previously, OPA had priced idle machinery under a regulation requiring that persons who do not ordinarily sell machines apply for specific prices.

General principles already established for pricing idle commodities will be applied to machinery, tools and other assembled industrial products. Revised maximum price regulation 204, which henceforth will govern sales of these articles, is based on the principle that no purchaser of idle or frozen inventories should pay more for them than to a regular supplier.

Meanwhile, OPA announced several changes and corrections in listed equivalents and further information as to serial numbers of obsolete machine tools. The changes will simplify the establishment of ceiling prices for machine tools and extras which are not listed with March 1, 1941, prices in Maximum Price Regulation No. 1, governing secondhand machine tools.

Machine Tool Distributors View Their War and Postwar Problems

FRENCH LICK — Present-day problems of the machine tool distributor and those he must face in the coming postwar era were discussed by members of the American Machine Tool Distributors' Association at the 20th spring meeting of the organization held at French Lick Springs Hotel, May 25 and 26.

The keynote speaker at the opening session was Tell Berna, general manager of the National Machine Tool Builders' Association. He reminded the members of the Distributors' Association that modern war rests on a base formed by the productive ability of metalworking tools and advocated the development of some arrangement by which government authorities can advise machine tool builders of the initiation of production programs that will require machine tools. Mr. Berna pointed out that as much as six weeks to two months production time could be gained if pool orders were placed when a program is initiated—otherwise there will be delay in producing munitions for which machine tool builders would be unjustly criticized.

Tell Berna

Of especial interest to the members was a report on recent developments in Washington by A. G. Bryant, president of Bryant Machinery & Engineering Co., recently named advisor on surplus machine tool disposal to the Reconstruction Finance Corporation. Mr. Bryant told the members of the distributors' association that while there is now a tendency in some quarters to feel that the battle of production is won, there is greater need today for close liaison between government and industry than ever before. Some of the problems to be faced in the immediate future are more far-reaching in their importance to industry than those encountered in 1942 and 1943. Mr. Bryant expressed the belief that those problems will affect the future of industry to a large extent and may even determine the very existence of the machine tool industry. Among them are: (1) foreign trade, (2) the termination of war contracts, (3) the disposal of machine tools owned by the government, and (4) the renegotiation of war contracts.

Mr. Bryant reminded the members present that foreign trade is important to the machine tool industry and to machine tool distributors and expressed concern about the recent decision of the Australian government to allow Australian machine tool distributors a maximum of three percent commission on machine tools imported from the United States, while permitting an average of about ten percent commission on rBitish-built machines. He reported that this action was taken with the sanction of some of the subofficials in the State Department and the Foreign Economic Administration, without consultation with the machine tool industry. This action in Australia, according to Mr. Bryant, is only an indication of what can happen here if industry is not continually in touch with Washington developments.

Efforts Lauded

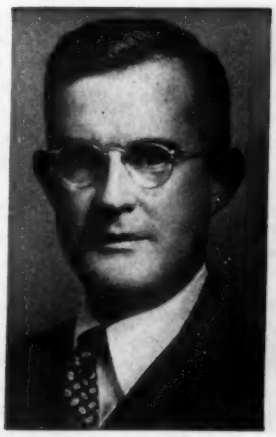
John S. Chafee, director, tools division, War Production Board, in his talk on "Present Machine Tool Problems from the Tools Division Angle" complimented the members of the Distributors' Association for the help they have given his division in seeing to it that the best use is made of available equipment. He pointed out that approximately $1,800,000,000 worth of pool orders for machine tools were authorized and that less than two percent of these remain unassigned or uncanceled. Furthermore, according to Mr. Chafee, that small percentage includes a large portion of such items as rifling machines and large special boring mills for tank turrets which were in great demand but have become obsolete due to improved methods introduced by the metal working machinery industry. He also said that while it was estimated several months ago that the machine tool industry would be called on to make only about $325,000,000 worth of machine tools in 1944, changes in production programs have made it necessary to increase that estimate to about $500,000,000 to $600,000,000. According to Mr. Chafee, the present situation is one of deciding how we are to get sufficient machine tools for day-to-day requirements, for Russian needs, for unexpected demands of the various contracts and subcontracts for trucks, larger aircraft engines and for the artillery, ammunition and other programs which appear. Obviously we must do a continuing and better job in the use and adaptation of available equipment. While every effort has been made to locate and put to use available units, less than 10,000 machines have been reported as available by various agencies. He requested help in finding machines suitable for transfer to other work.

Weapon Superiority Cited

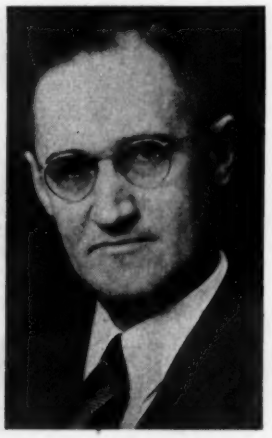
Major General L. H. Campbell, Jr., chief of ordnance, War Department, was the guest speaker at the dinner held Thursday night. He cited a number of instances which prove the superiority of our weapons, and complimented the association for the work that has been done by the machine tool distributors in furthering war production. He expressed the appreciation of the Ordnance Department for the work of the machine tool panels in the various ordnance districts, and pointed out that these panels would not have been successful without the full cooperation of the machine tool distributors.

An innovation was the inclusion of technical speakers on the associations' program. W. R. King and S. D. Fendley of General Electric's Apparatus Department discussed the use of electronic control devices in the machine tool field and told about a number of developments in the application of electronics to motor control which promise important future applications along this line. The high-speed carbide milling of steel was discussed by Dr. H. A. Frommelt, director of research, Kearney & Trecker Corp. He used a motion picture film to show some of the production operations in west-coast aircraft plants where this technique has been applied successfully.

A. G. Bryant



John H. Chafee



W. R. King

Discuss War and Postwar Problems At 28th Annual Meeting of A.G.M.A.

RYE, N. Y.—A busy three-day program held the attention of a record-breaking attendance of members and guests at the 28th annual meeting of the American Gear Manufacturers Association on May 22-24, at the Westchester Country Club. The sessions included a report on war-torn Europe, an appraisal of postwar industry, the presentation of several engineering papers and the development of technical standards. Proceedings were started by an address of welcome by retiring A.G.M.A. President R. C. Ball, Philadelphia Gear Works.

The international situation was the subject of a talk at the annual dinner by Jan Masaryk, foreign minister and vice-premier of the Czechoslovak government in exile, who was in this country on a short visit. He pointed out that the task of rebuilding Europe would entail a revival of intellectual and moral values that the enemy has so ruthlessly attempted to destroy as well as the restoration of property needed to put occupied countries on a self-sustaining basis.

See High Postwar Output

An excellent account of what industry might look for when peace has been restored was given by F. D. Newbury, vice-president, Westinghouse Electric & Manufacturing Co. He predicted a higher level of manufacturing activity after the war than before it, but not a maintenance of the present peak levels. According to Mr. Newbury a wholesome degree of employment will depend on a relaxation of rigid government controls on business and industry.

A luncheon meeting was addressed by William E. Robinson, vice-president and advertising director, New York Herald Tribune. Mr. Robinson discussed many of the business problems resulting from the great dependence on the government that the war has intensified. He pointed out the necessity of independent planning to avoid the threat from within of the same kind of political thinking that we are fighting in Europe.

Walter E. Schmitter

Walter E. Schmitter, chief engineer, the Falk Corporation, received the Edward P. Connell award for his contributions to the gear industry. Mr. Schmitter is a past president of the Association and has taken a leading part in its technical activities, having served as chairman on many of its committees. He is the third recipient of the award.

Louis R. Botsai

Two divergent views on gear design were given in papers by M. Maletz, analytical mechanical engineer, Kearney & Trecker Corp., and John O. Almen, research division, General Motors Corp.

Mr. Almen spoke on aircraft gearing and emphasized the need of a statistical basis of design in this field. He outlined three kinds of gear failure and then showed charts which he had prepared from the experiences of four leading aircraft engine manufacturers. Mr. Maletz, on the other hand, stressed a need for an analytical approach to the problem of gear life. He traced briefly the history of gear stress analysis and offered a new approach to the problem.

Discuss Bearing Load Ratings

Another technical paper "Bearings —Their Loads and Mountings in Gear Drives" was given by Henry W. Kayser, development engineer, the Falk Corporation; this author discussed sleeve and anti-friction bearings, including the factors influencing their selection, and the subject of bearing loads in general. The paper started a spirited discussion which brought out a need for uniform bearing load ratings.

Three new recommended practices were approved by the Association. These were "Fine Pitch Straight Bevel Gears," "Bevel Gear Speed Reducers and Combination Speed Reducers," and "Grading of Cast Iron Gears for Durability and Strength." Committees on other technical subjects reported considerable progress.

Paul W. Christensen

The success of the meeting was due to the efforts of Fred W. Walker, Philadelphia Gear Works, chairman of the program committee, T. F. Scannell, The Falk Corporation, chairman of the entertainment committee, and Newbold C. Goin, A.G.M.A. executive secretary. It was announced that the next meeting would be held at the Edgewater Beach Hotel, Chicago, Oct. 30-Nov. 1.

NEW OFFICERS OF THE A.G.M.A.

President
LOUIS R. BOTSAI
Westinghouse Electric & Manufacturing Co.

Vice President
PAUL W. CHRISTENSEN
Cincinnati Gear Company

Treasurer
R. B. TRIPP
Ohio Forge & Machine Co.

Executive Secretary
NEWBOLD C. GOIN

Executive Committee Members
A. H. CANDEE
Gleason Works
J. W. HERTZLER
De Laval Steam Turbine Co.
W. L. SCHNEIDER
Falk Corporation
C. R. STAUB
Michigan Tool Co.

Inside Detroit

BY SILER FREEMAN

Worry Over Arsenal Ability

The wave of strikes and work stoppages has caused some pessimism concerning this area's ability to make good its boast as the "Arsenal of Democracy." The long-drawn out foremen's strike, the several production interruptions at Chrysler, and other labor trouble in the city have caused auto firms to fall behind production schedules just when military requirements are most pressing.

There are signs that labor, at least in some quarters, now realizes it has gone too far in attempting to dictate to management. Meanwhile, the loss in production is being made up by such expedients as calling off the Memorial week-end, which might have stretched from Saturday to Wednesday. All Army and Navy procurement agencies joined with the regional WPB in urging workers to stay on the jobs over Decoration Day.

Only Willow Run is absolved from this order. Being ahead of schedule, the bomber plant was shut down for two days for inventory purposes. Very soon Ford will produce one Liberator for every hour of the day, and will no longer ship components to four assembly plants elsewhere. Its facilities will be devoted exclusively to operating its own final assembly lines at the rate Henry Ford predicted.

Lays Down the Law

Perhaps the UAW-CIO's "no strike pledge" will come to have some significance. On the heels of taking over Chrysler Local 490 and dismissing 14 officers, R. J. Thomas, president of the UAW, appealed to the membership. He said that the many wildcat strikes have inflamed public opinion against the union, and warned that unless unauthorized strikes ceased at once, the union cannot survive, and that "restrictive legislation, worse than anything now on the books, will be enacted."

He declared that there is no such thing today as a legitimate picket line and that "such picket lines should be ignored." He closed his appeal by saying "we must restrain ourselves and our hot-headed brothers. If we do not there will be no union after the war."

As Thomas was addressing his appeal to the union, there was very little bread in Detroit due to the bakery drivers' strike.

Parts Program Approved

Packard's long fight to restore its parts production line has finally been crowned with success. Its $975,000 facility contract has been approved which will put its old production machinery in place, reactivate its cast iron foundry and fill in the missing machine tools which it gave up to the automotive industry pool when it converted to war work.

It was Packard's all-out conversion that helped it get approval to restore its machines. It was one of the few companies that tore out all vestige of automotive production when it began to build Rolls-Royce and marine engines.

Of the $975,000 approved for the restoration of its parts line, only $46,000 will be used to replace tools and machines. But since this is about the first instance of an automotive manufacturer being permitted to order peace-time machine tools, it may be a historic event, despite the smallness of the order.

The company will spend more than half of the total, $546,228, to reinstall the idle machinery. At the time he announced the plans to begin building spare parts again, George T. Christopher, president of Packard, pointed out that the line will be only skeleton in form. But it would be a start, he pointed out. Even if the machinery is not being placed in the most ideal location and will probably be moved when the big reconversion comes, it will take the machines out of the yards and put them to work.

The WPB approval for Packard came after a long, hard fight. It was predicated on the need of the Army for additional casting and machine capacity. It was specifically set out that Packard must hold 90 per cent of its capacity for the military items which carry high-urgency ratings. Principally it would be devoted to cylinder blocks, crankshafts and camshafts for the Army program.

The other 10 percent will be given over to parts for taxis, ambulances, hearses and civilian cars. The principal shortages here are in crankshafts, cylinder blocks, valves, camshafts, cylinder heads, connecting rods, rear axle shafts, steering knuckles and front wheel suspensions.

Although Christopher's original announcement of going back in parts production stressed the move as the initial reconversion step, WPB emphasized that its permission was not to be construed in any sense an okay on reconversion. It was primarily in the interest of the war program, rather than the civilian help it would provide, a spokesman stated.

Noses Added Here — Nose adapters are brazed to 4.2 chemical mortar shells with a Tocco high frequency induction unit at Lempco Products, Inc. Brazing time per shell is 19 sec., with four shells being handled in two double inductor blocks. This brazing operation is in addition to one used to affix base plugs to seamless steel tubing to form the shell casing, replacing forged cases and saving metal

Another Departure

Another vivid chapter has been written in the Ford saga. Ernest G. Liebold, former personal secretary to Henry Ford, has left the Ford company.

Like in the case of Charles E. Sorensen, the company was silent on the method of the parting. But unlike Sorensen, Liebold came forward himself to announce that he had been fired and had not resigned.

Liebold became Henry Ford's private secretary in 1910, after the elder Ford had "mislaid" a check for $70,000. He was general manager of the Dearborn Independent when it involved Ford in a lawsuit that had international attention. He sponsored the move to make Ford president of the United States.

For many years, Liebold was all-powerful in the Ford organization. But his power faded with the years. In 1933, he disappeared and after two days, he was found in Traverse City, apparently the victim of amnesia. Since then he has had little part in the company affairs.

Management's Collective Bargaining Stake Considered at Conference

NEW YORK—Management and labor are faced with the task of adapting "wartime experience to the needs of peacetime industrial relations, so that we can avoid drastic readjustments when the pressures of war have been removed and the government has, I trust, stepped out of the field of labor arbitration," so declared William H. Davis, chairman of the National War Labor Board, speaking at the concluding dinner session of a conference of 1,500 employers and representatives of management held at the Hotel Astor, here, under the auspices of the American Management Association.

The alternative, he warned, would be continued government interference, perhaps in more drastic form. "When the government moves out of its wartime place as a direct participant in industrial affairs, a vacuum will be created if management and labor have found nothing to fill its place; chaotic labor relations will occupy the vacuum. Sound collective bargaining is the natural choice to replace the government wartime influence" and prevent this chaotic condition.

Called to discuss "Management's Stake in Collective Bargaining," the conference was devoted to study of techniques for improving collective bargaining within the industrial plant. With the over-all aim of "getting government out of labor relations," the sessions sought to point out that the only way that substantial improvement can begin in labor relations is to get labor and management to "stop running to the government to settle every issue, large and small, that arises between them," according to Alvin E. Dodd, president of the Association.

Urges Permanency

At the morning session, Dr. George W. Taylor, vice chairman of the National Labor Relations Board emphasized management's tremendous stake in making collective bargaining a permanent institution.

"It had better be permanent," Dr. Taylor said, "because of all the drives being made by the common man, the collective bargaining drive is the only one which accepts the capitalist system. If anybody thinks the workers will return to having no voice in matters that affect them he is mistaken."

Lloyd Garrison, another public member of the WLB, who followed Dr. Taylor, spoke of the contribution made by the board in the task of wage adjustment and the strengthening of collective bargaining, declaring that the experience accumulated by industry and labor through the board should serve as a valuable guide in molding postwar employer-employe relations.

Bargained Away Rights

Another dinner session speaker, Thomas Roy Jones, president, American Type Founders, Inc., pointed out that large numbers of company management groups have lost to labor rights of their stockholders, the government and the public.

Mr. Jones urged "efforts to see that governmental participation is confined to conciliation and legal processes." He suggested that "the present scope of bargaining be broadened so that the labor conference becomes a true bargaining conference."

"Management does not seem to realize that it too has a right to make demands, not only the right but the obligation to do so," said Mr. Jones. "Management must demand and get cooperation for quality and lowered costs so that there will be more and better goods for more people."

Mr. Jones attributed to government much of the crisis now confronting management. "We of management face one of the greatest industrial crises of all times," Mr. Jones said.

Other speakers at the conference included Lee H. Hill, vice president of the Allis-Chalmers Manufacturing Co., who spoke on management's rights in the day-to-day bargaining, and Mrs. Elinore M. Herrick, former regional director of the NLRB and now director of personnel of the Todd Shipyards Corporation, who discussed the application of seniority provisions in collective agreements.

The role of the umpire in the operation of collective bargaining agreements was discussed by G. Allan Dash, Jr., impartial umpire under agreements of the General Motors Corporation, and Harry Schulman, impartial chairman administering agreements covering the Ford Motor Company.

TO MAKE VEHICLES IN '45

WASHINGTON — During 1945 there will be produced 639 street cars, 348 trolley coaches, 10,392 integral buses and 13,100 bus bodies, according to a program announced by WPBs Transportation Equipment Division.

Production will be markedly heavier in the first and second quarters than during the remainder of the year.

The office of Defense Transportation is the principal claimant agency for these transit vehicles, WPB says. Canada is claimant for a small quantity of each type of vehicle. The Army, Navy, Maritime Commission and the Foreign Economic Administration are claimants for bus bodies.

Inverted Construction—LCM-3 lighters being produced by Warren City Manufacturing Co. are completely welded and are constructed, upside down, on a modern type assembly line. They are turned rightside up for final fabrication and engine installation. Each is tested in a 34,000 gal. tank

Wartime Washington

Foremen Unionization Unsettled

The reaction of official Washington to the crisis in the unionization of foremen was mixed. Almost everybody agreed that the ending of the strike settled nothing and merely left the problem to be resolved later. The main issue is whether foremen are part of management or not. If they are, they should not be permitted to unionize. A leading New Dealer expressed the opinion that foremen should be allowed to form a union and bargain collectively if they wished, pointing out that foremen's unions have existed for years in the coal mining industry. He expressed doubt in the same breath that there is any great urge among foremen to organize, except where they have been poorly treated. One top official said that the real grievance of foremen arises from the fact that in some cases they are paid less than the men working for them. This situation can be remedied by seeing that foremen are paid perhaps 20 percent more than any of their men. The feeling prevails in Washington that the eventual outcome of the controversy at Detroit will determine in large measure what happens to unionization of foremen nationally.

Army Above Strength

After the country got the impression that huge numbers of men were going to be needed by the services, the fact is revealed that the Army is above its desired strength of 7,700,000 men, which was whittled to that projected size last summer from an earlier program of 8,200,000. From now on, the task will be one of replacement. The total force is divided roughly into three parts: ground forces, service forces and the air forces. For every combat division of 15,000 men, a slightly larger number of non-combat troops is required.

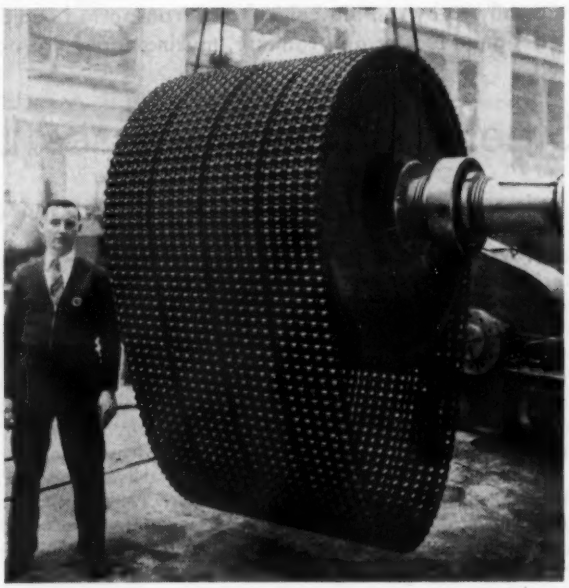
Satisfied but Determined

Confident optimism tempered by the realization of considerable hard work that remains to be done describes the feeling in some of Washington's top war production quarters. War production, even including programs such as high octane gasoline, landing craft and bearings, is considered "pretty good." From the stringent bearing shortage of only a few weeks ago the situation has eased to a point where by mid-July no trouble is expected along this line.

Will Ease Components

Even aircraft production, which has been slugged upward at an astronomical rate since well before Pearl Harbor, is approaching the point at which it will be flattened out as much because of a sufficiency of planes as because of inability to push it higher without unreasonable expenditure of manpower and facilities. This will not antedate the year's end by much if at all. But when it arrives, the shortages of several components, notably bearings and fractional horsepower motors, will no longer exist. When the capital equipment of the air forces has been manufactured and further production is for replacement purposes only, there may well be a cut in aircraft production. It has been pointed out that in fractional horsepower motors alone a 20 percent cut in aircraft would release enough facilities to make as many such motors as were produced in this country before the war.

Tug Tendons — Over ten thousand parts are assembled into this marine propeller drive assembled by Morse Chain Co. for U. S. Navy 110-ft. harbor tugs. In what is said to be the largest application of its kind, this drive couples two direct-reversing diesel engines to a single propeller with 3 to 1 reduction and is understood to provide efficiency, economy and flexibility of engine room layout



See Improved Manpower

Manpower as a whole should improve and relatively soon, according to Washington production officials, but it will be spotty and serious local shortages will have to be met. One west coast area currently struggling with a 40,000-worker shortage is faced with the need for an additional 30,000 workers to meet new developments from the military services who are carrying on considerable activity on the West Coast.

Still Emphasize Trucks

The heavy truck program is a must in all its plants if there is to be transportation in those parts of Europe which the Nazis evacuate. This program must boom along, particularly this summer. Those parts of it which normally experience labor letdowns during the summer will have to be kept operating if the program is to meet the needs for which it was conceived. This is one of the important programs which will be just as pressing after the invasion as it is now.

Postwar Tool Orders in Fall

Machine tool industry may get its first crack at filling postwar orders by early fall. WPB people admit that there was perhaps too much diversification in tool plants after the back of the tool program was broken. They explain it as a result of WPB's eagerness to make the greatest possible use of the industry's abilities. One official described the trade as "a honey of an industry."

WPB Awaits Car Need Peek

Demand for new automobiles has not reached the peak it must attain before WPB overrules the industry and orders some new cars built. When it does, the cars will go on the production line regardless of any complaint, for WPB recognizes the necessity for keeping the war-working population on wheels. If the necessity arose at a time when only a very few of the automobile manufacturers could be spared from other war work, the industry's objection to a piecemeal reconversion to car output would not suffice, nor would industry's argument for pro-rata company participation.

Stratosphere Smacker—A powerful stratosphere weapon capable of reaching an objective more than 11 miles in the air, first exhibited and demonstrated publicly by the War Department at the Army Service Forces "Weapons of War" Exhibit, Washington, has been produced in quantity by the Fisher Body Division of General Motors. Called the 120 mm. or 4.7 in. anti-aircraft gun, it may also be lowered for use against ground targets, operated manually or by remote control and transported rapidly. Its automatic Fisher-designed loader and rammer, making rapid fire possible from any angle

Steel Institute Discusses Labor Relations and Postwar Demand

NEW YORK—Since Pearl Harbor the steel industry has produced 225,000,000 tons of ingots and castings, of which 90,000,000 tons were made in the last twelve months, reported Walter S. Tower, president of the American Iron and Steel Institute, addressing that body's fifty-third general meeting at the Waldorf-Astoria, here.

"Through each successive stage of shifting programs, expansions and speed-ups, the flow of steel has kept production schedules going," Mr. Tower said. "No vital need suffered from lack of steel. No program was delayed because steel was not on hand. Your record of production has met or exceeded programs which were originally set as 'schedules of perfection.' Steelmakers have acted on the principle that performance is the best answer to criticism."

Mr. Tower used statistics to prove that steel makers have not profited unduly from war business. "In 1929 net income was equal to more than $9 per ton of rolled products made. In 1937 the figure was almost $6 per ton. In 1943 it was just above $3.

"The present outlook," Mr. Tower predicted, "is for decreasing rather than greater overall production for direct war uses, and it is doubtful whether any probable shift toward larger civilian consumption will keep pace with the speed of war program curtailment. The effects of these and other factors make it seem unlikely that production in the calendar year 1944 will go much, if any, above the mark set last year, in spite of more steelmaking capacity now available."

Estimates Postwar Output

Discounting "free wheeling" methods of estimating postwar demands for steel, Mr. Tower stated that cold facts of past needs and reasonably anticipated future needs for civilian markets "suggest a figure in the range of 65 to 70 million tons of ingots in good" postwar years.

As for the capacity not needed to meet postwar requirements, he suggested: "Use it to produce steel for export; or dismantle uneconomical or marginal units; or treat as stand-by plants" government-financed units which industry does acquire.

Direct relations between employers and employees without use of intermediaries, and collective bargaining on a company basis instead of an industry basis, were urged by Leo Wolman, professor of economics, Columbia U.

While praising Professor Wolman's speech as "the most well prepared" labor relations analysis he had ever heard, Eugene G. Grace, Bethlehem Steel Corp. president, held that a "pooling of brains in many companies would be of service to all in establishing and maintaining sound labor relations."

Gary Memorial Award Made

The Gary Memorial was awarded Quincy Bent, vice president, Bethlehem Steel, "for outstanding leadership in the art of steel production and in contributions to the development of alloy steels to meet the needs of war emergency."

The need of improved public relations, with a view to improving understanding of the steel industry, was stressed by Irving S. Olds, chairman, U. S. Steel Corp., and E. L. Ryerson, chairman, Inland Steel.

Timken Plans for Postwar Trade with South America

CANTON, OHIO—In anticipation of a great postwar acceleration of industrial growth in South America, The Timken Roller Bearing Company has organized a subsidiary, The Timken Roller Bearing Company of South America.

Jules A. Moriand, former New York representative and now manager of the South American subsidiary, reports from Sao Paulo, its headquarters, "Industrial machinery manufacturing in Brazil is already well planted and is progressing rapidly especially in the following lines: Farm machinery, airplane bodies (with motor manufacturing soon to start), machine tools, steel (reinforcing bars, commercial rods, strip—now being manufactured and to be followed in 1945 by rails, shapes and plates), electric machinery (especially motors of small hp.), mine cars, elevators, cranes, pumps, etc. The age of Brazilian manufacturing concerns averages approximately five years and due to import restrictions these companies are forging ahead at a rapid rate."

As a part of its organization program, Timken has two young Brazilian engineers in its plant here, familiarizing themselves with the engineering production and application of the company's products. They expect to remain a year and a half and then return to South America as field engineers and general representatives of the company.

Spotting the Air News

Cut to Come in Early '45

Cut-back in warplanes is now in sight. If the war continues in both theatres along the present rising scale, curtailment of aircraft production can be expected about the first of next year. This estimate is from a top man in the government's aircraft program. He said that our present rate of output, less relatively moderate losses, will give the Army and Navy, as many planes as they will have space and use for, about that time. If hostilities in Europe should cease before then, the cutback might follow it shortly, due to the enormous amount of equipment that could be pulled over to the Pacific.

Losses Were Less

Reduction in Navy fighters, due mostly to losses one-third less than expected, was the first step in aircraft contract terminations which will eventually move that vast industry back to perhaps five percent of its wartime maximum, which will be reached this year. (The tonnage of aircraft output will continue upwards, for a while, despite cutbacks.) There were two other reasons for scaling down the Navy's fighter program. One was that the new Grumman Hellcat is a better airplane (no reflection on Vought's Corsair, which is old now, as airplanes go). The other reason is that some officials in the Navy, and the House Naval Affairs Committee, have wanted for months to drop the Brewster plants (which took the brunt of the Corsair cutback) because of inefficiency, which was not notably helped by the recent presidency of Henry J. Kaiser. When the ax falls again it will land on producers with poor records.

Reputation Suffered

Brewster's future will be watched by the metal working industry and others, with interest. This firm formerly built Brewster bodies for cars; it had the finest traditions of workmanship, highly praised by Navy. Since the war started it has been bedeviled by labor troubles and a succession of managements—all but Kaiser thrown out by the Navy. At this writing the Company seemed to be in the market for a new war contract or for materials to begin production of something for the civilian market.

Unveil Superfortress

When you read this, the Army probably will have permitted Boeing to publish pictures of the B-29 bomber and tell a few facts. The Superfortress has been in action and its deportment was satisfactory. Large numbers of them are on both fronts, and both enemies know it. The B-29 has become an intricate mechanism, more so than expected, over its long development period: like most other successful planes, it is several years old at the time of its initiation. Present heavy bombers can hit any part of Hitler's Europe, but the B-29s can do it with much heavier loads. The Navy may take the honor of starting work on Japan with carrier based bombers, but the B-29s will be first to reach Nippon from land bases. The Superfortress program is tremendous in terms of tons, time and money and probably it will not be exceeded in this war.

Builder and Fighter Inspect — General H. H. Arnold, commanding general, USA Air Forces, right, recently accompanied K. T. Keller, Chrysler Corporation president, on an inspection trip of that firm's huge Dodge Chicago plant, where an ever increasing number of 18-cylinder, 2,200 hp. aircooled Wright engines are made for B-29 super-fortress and other big aircraft

False Front

German fighter strength looks almost as formidable as ever, in the news, but it's a hollow shell. Sound air power includes: (1) a strong force at the front; (2) a reserve approximately equal to the active force; (3) a steady flow in pipelines to reserves; (4) a strong production plant at the other end of the pipeline. The Luftwaffe still has the strong force in action, but reserves are badly depleted; factories have been heavily damaged; and the pipeline flow is dwindling. That is the status of the air war as Gen. H. H. Arnold, chief of the Air Forces, explained to a group of writers, including this one.

Development Continues

New helicopters are showing up nearly every change of the moon but they all follow basic principles. Nevertheless, they are hammering out improvements. Bell Aircraft's copter simplifies the hub mechanism by using two rotor blades instead of four, and it mounts a conventional horizontally

See How — Bearings no longer may have the privacy in which they are accustomed to operate! By making both bearing and journal of Lucite, Westinghouse researchers are able to check visually the computed or empirical details of bearing design. Oil, colored with a red pigment, is introduced into the bearing in various ways and the lubrication effectiveness is immediately apparent

opposed engine instead of the special vertical type used by some others. Aeronautical Products, Inc., is running tests on a new design which it believes will do 100 m.p.h. as compared with slower speeds by others. Igor Sikorsky, of United Aircraft, pioneer helio designer, has developed two new machines with greater power and carrying capacity, which United says will be in production this year. Probably one of these is the 14-passenger job in which he was interested. No doubt professional pilots will fly taxicopters long before citizen airmen will be able to handle delicate vertical lift controls which, one expert said, is like "sitting on a greased ball."

Notes for Your Book

Kaiser-Hughes plywood flying vessel, on which work is being continued against strong opposition, will mount eight engines. . . . The British aircraft industry alone in three days could produce enough planes to run the world's commercial airlines for five years.

Show Cut-back Procedure

WASHINGTON—A booklet issued by Army Service Forces and entitled "Adjustment of Production Cut-backs," is designed to outline, simply and graphically, the procedures through which the Army passes before making any reduction in production program and resultant cancellation of contracts.

Find Idle Screw Machines

CLEVELAND—To facilitate location of available screw machine capacity, the National Screw Machine Products Association has set up a clearing house to which member companies are reporting present and anticipated capacity. Additional information furnished by these companies enables the Association to locate promptly the manufacturers best equipped to produce a particular part.

The service may be obtained free by buyers of screw machine products by furnishing a description of the necessary part, including type of material, tolerances and quantity required. Inquiries should be addressed to Dept. K, National Screw Machine Products Assn., 13210 Shaker Square, Cleveland 20, Ohio.

Report Truck Bookings

CHICAGO—Domestic bookings of electric industrial trucks and tractors during the month of February, 1944, totalled 385 units, figures just released by the Industrial Truck Statistical Association indicate. The net value of chassis only booked during February totalled $1,965,802.50 compared with $510,492.50 in January.

Names in the News

Joseph G. Davidson

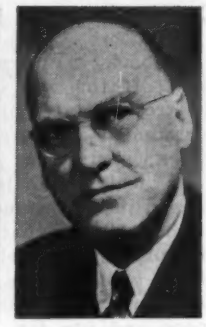
Seven new presidents have been elected in various subsidiary companies of Union Carbide and Carbon Corp. **Joseph G. Davidson** has been elected president of Carbide and Carbon Chemicals Corp. and Carbide and Carbon Chemicals, Ltd. Dr. Davidson has served with this company in both technical and executive capacities since its formation. **James W. McLaughlin,** the new president of the Bakelite Corp., has been with the various divisions of Union Carbide and Carbon for more than 20 years. He will direct all of the plastics operations in the different units of the corporation. **Stanley B. Kirk,** who has been with the corporation for about 30 years, becomes the new president of the Linde Air Products Co.,

J. W. McLaughlin

Francis P. Gormely

the Prest-O-Lite Co., the Dominion Oxygen Co. and the Prest-O-Lite Co. of Canada. **Arthur V. Wilker,** who has been active in production and research work at the National Carbon Co. for the last 35 years, has been named president of that Company. **Francis P. Gormely,** who started with the Union Carbide Co. in 1909, has been elected president of Electro Metallurgical Co., Electro Metallurgical Co. of Canada, Haynes Stellite Co., Michigan Northern Power Co. and Union Carbide Co. of Canada. **John D. Swain,** former sales executive of the Union Carbide Sales Co., becomes president of the Electro Metallurgical Sales Corp. and **John R. Van Fleet,** president of the Union Mines Development Corp., has been named president of the United States Vanadium Corp. also. Mr. Van Fleet has been identified with the natural resource supplies of the corporation for many years.

Stanley B. Kirk



Arthur V. Wilker

George S. Eveleth, assistant to the president, has been elected a vice president of the International General Electric Co., Schenectady, N. Y. Mr. Eveleth joined the company in 1920 and in addition to the above offices he is also vice president and director of Anderson Meyer & Co., China representative of the company, and a director of many other IGE foreign affiliates.

Julian A. Pollak has been elected president of The Pollak Steel Co., Cincinnati; **Albert C. Weihl,** vice president and general manager; **Virgil W. Prather,** secretary; and **Charles M. Grimm,** treasurer.

Thomas J. Kehane, who has been a member of the Worthington Pump and Machinery Corp. for 29 years, has been appointed commercial vice president in charge of the corporation's west coast activities with headquarters in San Francisco. He will also have under his supervision the territory covered by the Salt Lake City office.

H. Bissell Carey, president of the Automatic Refrigeration Co., Hartford, Conn., has been elected president of the Collins Co., Collinsville, Conn., foundry to succeed the late **Charles E. Taylor.** Mr. Carey is a director of several utility and insurance companies as well as the M. S. Little Mfg. Co. and the Standard Screw Co.

Ernest E. Anderson of Goddard and Goddard Co., Detroit, has resigned as works manager and director of that company effective June 1.

Charles J. Koch and **Frank D. Phillips** have been appointed managing engineer and assistant engineer respectively of the Induction Motor Engineering Div. of General Electric Co., Schenectady, N. Y. They replace **Howard Maxwell** and **Milton H. Wells,** who are retiring from the company.

Carl I. Collins

Earl A. Tanner

Earl A. Tanner, president of the Milcor Steel Co., Milwaukee, who has been with the Inland Steel Co. for the past 24 years, has also become president of the Inland Steel Container Co.

Carl I. Collins has been elected executive vice president and director of the Superior Steel Corp., Pittsburgh. Mr. Collins has had wide experience in various steel companies and comes to Superior Steel from Wickwire Spencer, where he was executive vice president.

R. C. Brannan of the Transformer Division at Westinghouse Electric & Mfg. Co. at Sharon, Pa., has been named manager of the transformer equipments section. Prior to this appointment, Mr. Brannan was a headquarters commercial engineer in the power transformer section of the Westinghouse transformer division.

J. T. Rettaliata has been appointed manager of Allis-Chalmers' new research and gas turbine development division. Dr. Rettaliata has earned annual awards from national engineering and scientific societies in the past three years for his work in the development of the gas turbine.

Jack E. Gould, who joined the U. S. Steel Corp. in 1930, has been named general superintendent of the Tubular Alloy Steel Corporation's tubular plant at Gary, Ind.

Otto W. Winter

Otto W. Winter has been appointed vice president of the Acme Pattern and Machine Co. of Buffalo. He has held numerous and varied positions in the machine tool industry and is a past president of the American Society of Tool Engineers. Mr. Winter also spent a period in Russia as a consultant on machine tool and cutting tool manufacture to the Soviet government.

Col. E. F. Miller has been made vice president and general manager of American Steel Export Mexicana, S. A., Mexico City.

John M. McKibben, former manager of the company's application and data department, has been named assistant to the vice president at Westinghouse Electric & Mfg. Co. Mr. McKibben has been with the company in various positions for the past 22 years and last year received the company's highest honor—the Order of Merit—for the "imaginative way he has dramatized the obligation of Westinghouse people to increase production of war material."

John M. McKibben

Edgar C. Thomas

Edgar C. Thomas, who for many years has been associated with the Thomas Machine Manufacturing Co., Pittsburgh, which his father founded, has been elected vice president of that company. Mr. Thomas was recently discharged from the U. S. Army with a rank of major. Prior to the war, he had charge of the company's Chicago and Philadelphia offices.

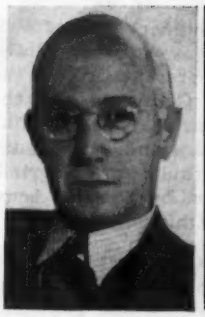
Allis-Chalmers

J. T. Rettaliata

Jack E. Gould

Maurice N. Trainer, first vice president of the American Brake Shoe Co., and president of the Brake Shoe and Castings Div., has been elected a director of the company.

Stanley H. Rose has been appointed head of the expanded office at 44 Whitehall St., New York City, of the Indianapolis Machinery Export Co., export division of the Indianapolis



Blank & Stoller

Stanley H. Rose G. Kochenderfer

Machinery & Supply Co., Indianapolis, Ind., to handle the sale of various lines of new machine tools in the export market. Mr. Rose has recently been associated with the company in charge of export sales of rebuilt machine tools and was formerly an export trade advisor for the U. S. Department of Commerce. **Gerald Kochenderfer** now has charge of sales of new machine tools for the latter company in the Indiana territory where the company was originally established as a rebuilder of machine tools. Mr. Kochenderfer was formerly Chicago district manager for the Warner & Swasey Co.

Earl R. Sayre has been appointed application engineer for the P. R. Mallory & Co., Inc., Indianapolis. Mr. Sayre was formerly associated with the Arrow-Hart and Hegeman Electric Company.

BUSINESS ITEMS

American Chain & Cable Co., Inc., Bridgeport, Conn., has acquired the **Wilson Mechanical Instrument Co., Inc.,** 383 Concord Ave., New York 54, N. Y., the sole maker of the "Rockwell" Hardness Tester. **Mr. Charles H. Wilson** will continue his association with the company.

The John E. Livingstone Co. of Detroit has been appointed exclusive agents for the line of forging, threading and tapping machinery made by **The Hill Acme Company.** Representation will cover Michigan, Lucas County of Ohio and the border cities of Canada across from Detroit.

Detrex Corp., Detroit, has enlarged two eastern sales and service offices and added another in the midwest. The Eastern region headquarters are now located in the Empire State Bldg. and are under the supervision of **Stanley A. Harris,** manager. The Philadelphia office has been moved to 12 South 12 St. with **Wayne Gaddy,** Philadelphia manager, in charge. The new Indiana office has been opened at 11 South Meridian St., Indianapolis, under the direction of **Charles M. Munns.**

The Moore Machinery Co. of San Francisco, Cal., has been appointed exclusive sales representative in the northern half of California and the state of Nevada for the sale of "Hill" open side vertical spindle and horizontal spindle hydraulic surface grinders as manufactured by **The Hill Acme Co.** of Cleveland, Ohio.

R. T. Palmer Co., West Hartford, Conn., has been appointed New England representative for the gage and precision instrument division of the **Sheffield Corporation. W. H. Gourlie**, formerly connected with Pratt & Whitney, is manager of the Palmer Co.

The Trumbull Electric Mfg. Co., Plainville, Conn., has announced the establishment of a separate southeastern district under the management of **H. S. Hill** with headquarters in the Red Rock Bldg., Atlanta 3, Ga. Mr. Hill, formerly with the Atlanta office, will have as his associates, **E. E. Frost, A. T. Allison** and **Hugh N. Delinger.**

Cap Screw & Nut Co., 15 Desbrosses St., New York 13, N. Y., announce the removal of their Newark branch to 165-171 Mulberry St., Newark 2, N. J.

Package Machinery Co., New York City, and **Phin Sales Co.**, Toronto, Can., have signed an agreement whereby Phin will become exclusive Canadian manufacturers of standard wrapping machines of Package design, all patents and designs being made available to the Canadian company. The firm will also continue as Canadian sales representative.

The partnership between **Thomas H. Speller** and **Wilbur Johndrew** heretofore conducted under the name of the **General Engineering Co.**, 785 Hertel Ave., Buffalo 7, N. Y., has been dissolved. The company has been acquired by **Mr. Speller** and shall continue under his direction.

OBITUARIES

John B. Chalmers, director of training schools and safety engineer of the Yale & Towne Manufacturing Co., Stamford Div., died n May 23 in the Stamford Div., died on May 23 in the hospital following a short illness.

Raymond R. Searles, vice president and works manager of the Fafnir Bearing Co., passed away May 27 at his home in New Britain, Conn. at the age of 64. Mr. Searles had been with the Fafnir Co. for 33 years and has taken out many patents for improvements in ball bearings.

Henry A. Zwierlein, 55, chief engineer of The Ajax Mfg. Co. since 1919 and with the organization for the past 18 years, died on May 7 after a brief illness.

John D. Bogle, electrical engineer at the Udylite Corp. for many years, died suddenly May 9 in Detroit. In his early career, Mr. Bogle assisted in the planning and erection of some of the country's largest hydro electric plants and later became well known in the metal finishing field where he held several important patents.

Harvey B. Bower, a vice president of the Chicago-Latrobe Twist Drill Works, passed away recently. Mr. Bower had been a member of the company since 1937 and covered the Wisconsin and Minnesota territory.

Michael M. Klosson, 51, a director and chief engineer of Buffalo Pumps, Inc., died suddenly on April 11 while on a trip to the West Coast. Mr. Klosson, one of the country's leading hydraulic engineers and a noted pump designer, had been connected with the company since 1920.

Eugene H. Baum, 43, vice president and general manager of the Montague Castings Co., Muskegon, Mich., died May 11 following an operation. Mr. Baum had been associated with the Michigan Foundry Supply Co. for some years before joining Michigan Castings Co. about a year ago.

Frederick E. Gage, 71, died recently in Pittsburgh. A former superintendent of American Steel & Wire Co., Mr. Gage had retired from the company in 1938 after 46 years of service.

Vernon Edler, 47, vice president and general manager of the Peerless Pump Div., Food Machinery Corp., died May 1 in Los Angeles, Cal.

John A. Longacre, recently retired vice president of the American Equipment Div., Pittsburgh Screw & Bolt Corp., of Norristown, Pa., passed away April 25.

Albert Haberer, 42, assistant chief engineer of the Fisher Body Div., General Motors Corp., and a member of the organization for 27 years, died May 14 in Detroit.

Elmer G. Johnson, plant superintendent with Clark Bros. Co., Olean, N. Y., a subsidiary of Dresser Mfg. Co., and formerly associated with the Bovaird & Seyfang Co., another Dresser subsidiary, passed away recently.

MEETINGS

American Electroplaters Society. Annual meeting. Hotel Cleveland, Cleveland, Ohio. June 12-14.

American Institute of Electrical Engineers. Summer Technical Meeting. Jefferson Hotel, St. Louis, Mo. June 26-30.

American Management Assn. Annual meeting. Hotel Pennsylvania, New York, N. Y. June 15.

American Society for Testing Materials. Annual meeting. Waldorf-Astoria Hotel, New York, N. Y. June 26-30.

American Society of Mechanical Engineers. Semi-annual meeting. William Penn Hotel, Pittsburgh. June 19-22.

Silver Bay Association. Silver Bay Industrial Conference. Lake George, N. Y. July 26-29.

Society of Automotive Engineers National Transportation & Maintenance Meeting. The Bellevue-Stratford, Philadelphia, Pa. June 28-29.

Plastic Rivet—Douglas Aircraft's process engineering supervisor at the El Segundo plant, S. H. Phillips, has developed a plastic rivet strong enough to bind plastic sheeting or surface control fabric to metal, wood or plastic. Plastic rivets can be installed where metal ones cannot be driven. The glass-like, center-bored rivets are expanded with compressed air to clinch them in place

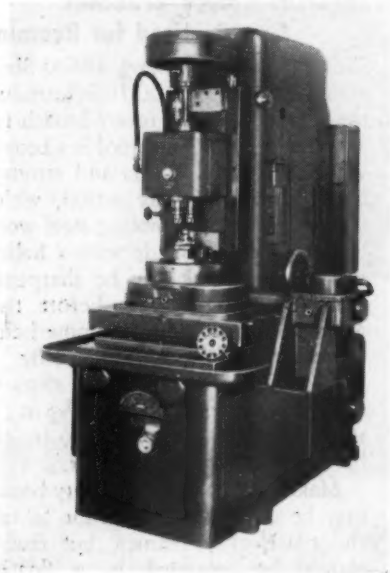
Shop Equipment News

Snyder Vertical Machine Mills Gear Flange Pocket

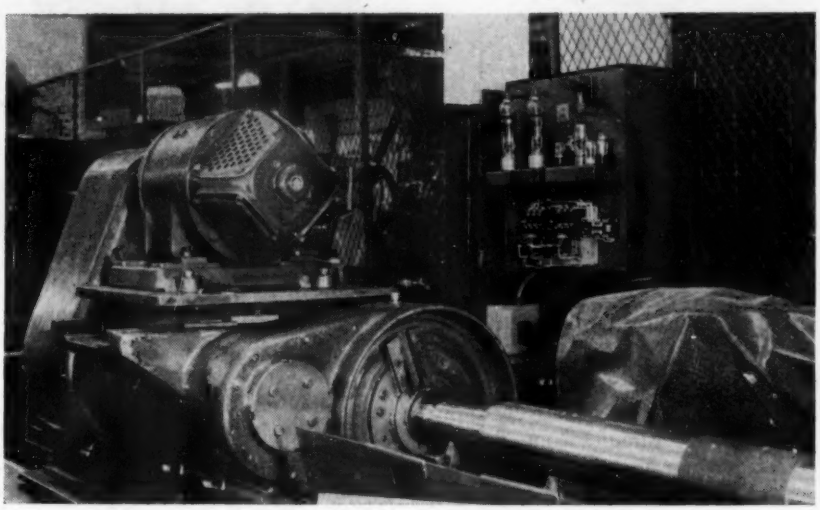
One of the latest special purpose machines designed and built by Snyder Tool & Engineering Co., 3400 E. Lafayette St., Detroit 7, Mich., is used to mill radius-shaped slots connecting two holes each, which serve as spring pocket clearance in gear flanges. Six slots are cut in each flange.

In this operation, the two-spindle head with ball-bearing mounted spindles, advances rapidly toward the work which is slowly reciprocating through an arc the length of the slot. Head and tools move into the work in small steps of from 0.010 to 0.060 in. per reciprocation of part. As each pair of slots is finish cut, the tools retract, hydraulic feed automatically resets itself and the fixture is indexed 60 deg., bringing the flange into position for the next cycle.

The round table contains index and table positioning mechanism. Index drive is through a splined shaft from the right hand side of the machine, where the index drive motor, worm wheel and control mechanism are mounted. Reciprocation of the main table is through rack and pinion by means of hydraulic cylinder plungers and is continuous throughout the entire machining cycle.



Snyder special vertical miller



Reliance electronic variable-speed drive mounted on machine

Reliance Electronic Variable-Speed Drive Provides Wide Speed Range With Light Comparative Motor Load

An electronic system of adjustable speed drive, operated from regular polyphase A.C. distribution systems to provide speed ranges 20 to 1 or better, is announced by The Reliance Electric & Engineering Co., Cleveland, Ohio. A substantially wider range of operating speeds can be obtained where, as in machine tool feed applications, the actual motor load is light.

The drive, which operates on 220, 440 or 550 volts, two or three phase, 25, 50 or 60 cycle, is now available in 1, 1½, 2, 3, and 5 hp. sizes. It closely parallels the rotating system of the all-electric adjustable speed V-S drive introduced earlier by Reliance. Choice between the two types will be dictated largely by considerations of cost and operating characteristics most desired. Cost of the new electronic drive will run from 20 to 100 percent more than the rotating system.

Space requirements for both systems are essentially the same, although elements of the electronic system may be distributed around the machine to occupy less noticeable space.

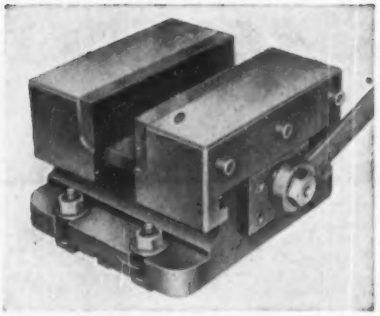
Physically, the drive consists of a small cabinet, housing tubes and transformers, a motor which is connected to the load and a start-stop-reverse pushbutton station which contains the speed-changing rheostat.

Functioning of the electronic system is based on voltage control. It makes possible controlled starting torque and controlled torque for braking and stopping. Starting, stopping and reversing operations can be controlled from one or more points about the driven machine.

Diamond Self-Centering Vise for Production Use

A production vise for milling, drilling and shaping is being marketed by Diamond Tool Co., 3429 E. Olympic Blvd., Los Angeles, Calif. It is self-centering, with both jaws being actuated by a hardened steel screw having opposite helices. Thus, by centering the tool between each jaw, work is automatically centered to tool regardless of stock thickness.

Jaws on the self-centering vise are serrated and hardened, with provision for removal and replacement if jaws of special shape are desired. The tongue included on the bottom of the vise aligns jaws with table edge and fits standard slot sizes. Both jaws open simultaneously, providing open-



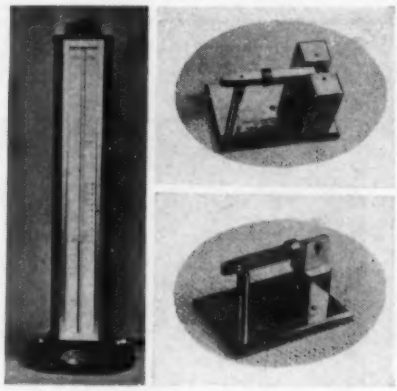
Diamond self-centering vise

ing for releasing and reloading work with a slight turn of the screw. Depth of jaws is 1⅝ in. and maximum opening 2 in.

Norton Simplex Lapper For Cylindrical Surfaces

Norton Company, Worcester, Mass., has produced a comparatively simple machine for simultaneous finishing operations on one or several cylindrical surfaces. Known as the Simplex lapper, can produce surface finishes as low as one micrometer RMS are obtainable in a single, quick, simple operation.

The Norton Simplex lapper has a capacity from ½ to 2 in. on diameters with lengths up to 24 in. It uses abrasive coated paper strips. Designed for versatile and quick-change operation it will handle concentric and eccentric cylindrical portions at the same time.



Metrical Metricator gage

Metrical Designs Gage for Checking Slots and Thickness

Metrical Laboratories, Inc., 417 Detroit St., Ann Arbor, Mich., is marketing a gage designed for measuring slots and thicknesses. These gages use the flow of air as the measuring medium and operate in conjunction with a single position Metricator.

The Metricator instrument is graduated to 0.00005 in. and can be read accurately to 0.000025 in. as a result of the high amplification representing 0.001 in. as a space of 4 in. on the scale. Gaging heads vary in size and shape according to application, and the instrument can be used to measure internal and external diameters and tappets, narrow grooves, straightness and concentricity.

The unit operates under an air pressure of approximately one pound and can be attached to a regular plant air supply. A regulator at the instrument brings pressure down to the desired value.

McDonald Resumes Manufacture Of Aluminum Alloy Safety Hat

B. F. McDonald Co., 5112 S. Hoover St., Los Angeles 37, Calif., has resumed manufacture of the type T safety hat made from a special aluminum alloy. The hat, complete with full floating headband, weighs 11¾ oz. An adjustable headband makes the hat fit all head sizes and is interchangeable in the two shell sizes available.

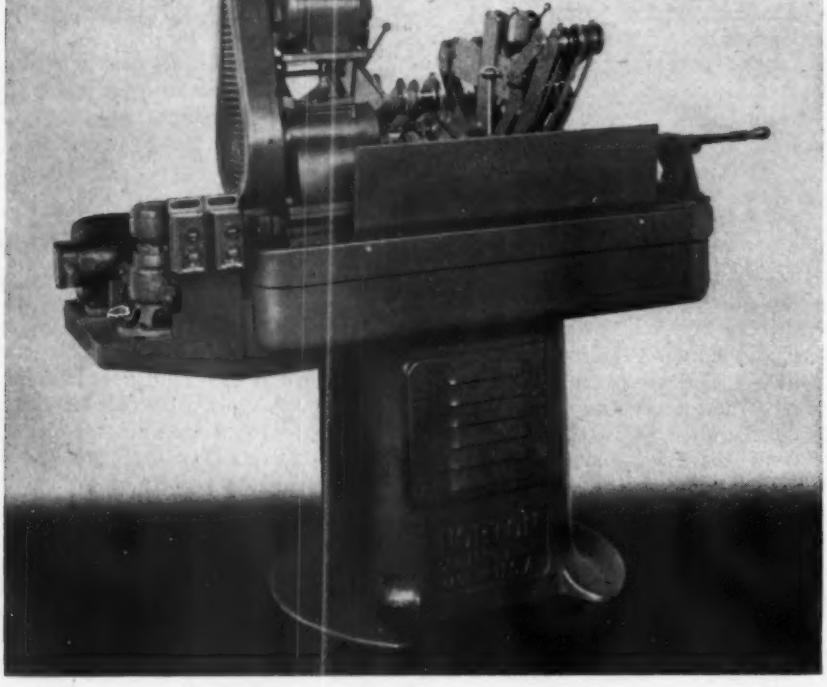
Shearmaster rotary broach

Shearcut Rotary Broaches May Be Used for Reaming

Shearcut Tool Company, 19600 Sherman Way, Reseda, Calif., is introducing the Shearmaster rotary broach for producing holes. The tool is a broach which rotates as it cuts and removes metal by a knife-like action, which results in ships resembling steel wool.

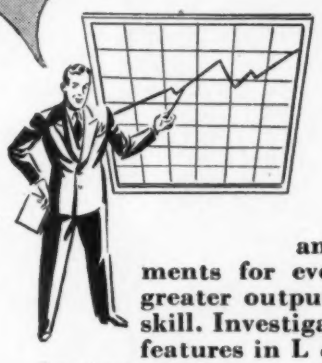
The broach is made with a helical cutting edge and may be sharpened from five to 30 times before they wear undersize. They are now being made with straight shanks only, in sizes from ¼ to 1 in., in steps of 1/16 in., and from 1⅛ to 1½ in., in steps of ⅛ in. Sizes up to 6 in. can be supplied on special order.

Makers claim that the rotary broach may be used in any machine to take the place of a reamer, but that it should be mounted in a floating holder.



Norton Simplex lapper

"Costs are greater today though we're making the same pre-war products. With these new L & S Lathes our manufacturing costs are kept in line."



WAGES have always been a major factor in production costs. More recently, new forms of taxation—plus additional clerical and accounting expenses imposed by legislation—have added heavily to the burden on production. From all indications, these high costs will prevail long after the war's end. Therefore, to keep manufacturing costs low—now and later—greater output per worker must be obtained, new, more efficient machinery must be utilized.

No matter what products you're making now—whether they're new or prewar—it will pay you to learn about the economies you can effect with up-to-date L & S Lathes. Every element needed to obtain favorable production costs is available in these modern machines. Automatic devices and manufacturing attachments for every type of work assure greater output with far less operating skill. Investigate these and many other features in L & S Lathes. To keep production moving up, costs moving down, Lodge & Shipley Engineers are always at your service.

PREPARE FOR THE COMING BATTLE OF MARKETS!

Competitive conditions in your field may be greatly changed when the time comes for reconversion. But one thing is sure—high cost producers won't make the grade. For a better product, at lowest possible cost, be sure to use the newest developments in machine tool design. But don't wait until the day of re-conversion to plan. Call in Lodge & Shipley Engineers now to study your future lathe requirements.

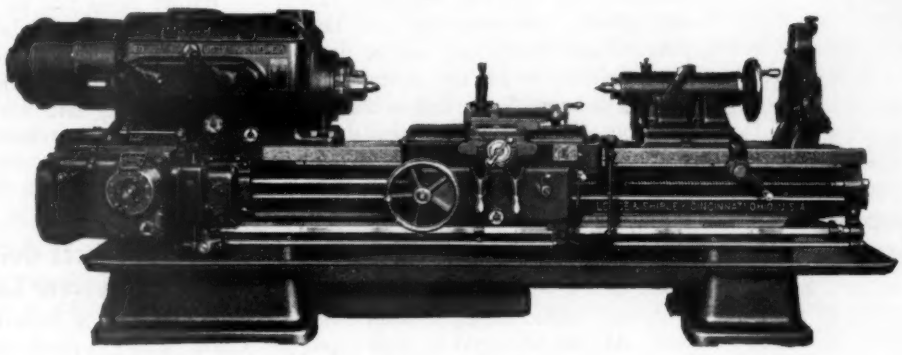


Illustration shows the 20" Selective Head Tool Room Lathe, designed to provide many years of highest quality precision work, and to furnish greater output at lower cost per piece. L & S Tool Room Lathes are available in a number of sizes to meet your special requirements. Write for Bulletin No. 508-BO.

ENGINE
AUTOMATIC
TOOL ROOM
OIL COUNTRY
LATHES

THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI 25, OHIO, U. S. A.

L & S LATHES

Elgin sapphire gage

Elgin Watch Introduces Plug And Ring Gages of Sapphire

Synthetic sapphire is being used by the Elgin National Watch Company, Elgin, Ill., for the manufacture of plug and ring gages. Such gages are said to outwear those made of steel by many times.

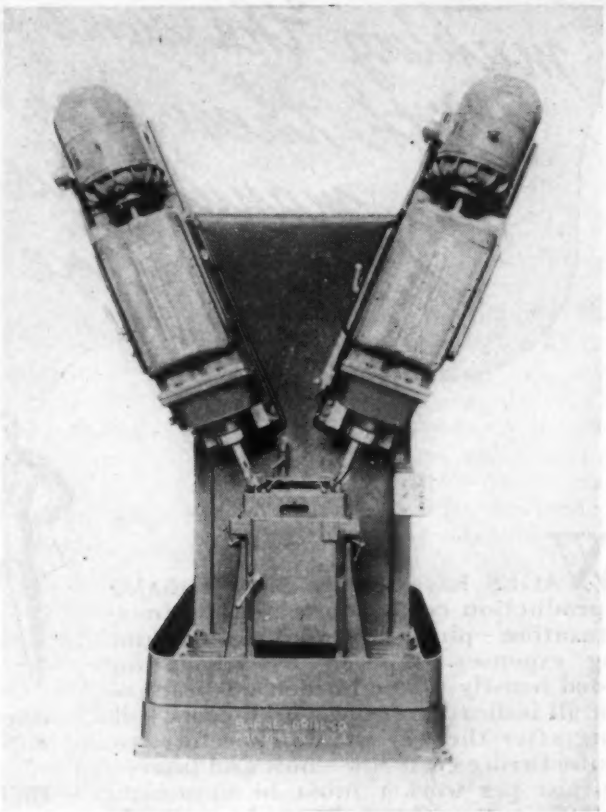
Because of their extreme hardness, these gages are ordered for exactly the size needed, with no wear allowance necessary. Tests have shown that sapphire gages will stand up under the shock of ordinary use. They are not subject to burring and are unaffected by any known chemicals.

Waltham cutter sharpener

Waltham Cutter Sharpener Is Designed for Bench Use

Designed for bench use in sharpening tools and cutters up to 2 in. diameter and ⅜ in. thick, the Waltham cutter sharpened is now available from Waltham Machine Works, Waltham, Mass. It can be used for sharpening cutters for gear cutting, thread milling, circular form tools, straight fluted hobs and multiple cutters. They may be sharpened radially or with any desired rake angle. Edward Blake Company, 634 Commonwealth Ave., Newton Centre 59, Mass., is exclusive sales agent for this machine.

Barnes Drill Produces Special Drilling Unit That Can Be Used for Many Different Operations



Barnes drilling units, angularly mounted

Barnes Drill Co., 814 Chestnut St., Rockford, Ill., has announced the completion of a special hydraulic production drilling unit that can be arranged for drilling, reaming, facing, boring, counterboring and tapping. These operations can be done with the units in any one or combination of horizontal, vertical or angular positions. Three sizes are available.

The two large units (Nos. 10 and 20) have essential parts built in, complete with a single motor driving the spindle and hydraulic pump for any automatic hydraulic feed cycle. The small unit (No. 5) is equipped with a separate motor driven hydraulic system. All are arranged to give rapid approach, variable feed and quick return.

They may be arranged for horizontal operations, either as single units, grouped around an indexing table, or in combination with vertical and angular applications. Each unit has a flange support for mounting interchangeable auxiliary heads of any desired number and arrangement of spindles. One standard unit, equipped with an 8-spindle auxiliary head and used horizontally as a self-oiling pro duction machine, is capable of facing and counterboring as many as eight bosses simultaneously.

Barnes units can be furnished on columns, horizontal beds, supports, indexing tables and other elements as complete machines. They can be converted quickly and economically for any future requirements that vary from original needs.

Acme Announces Quick-Start Fluorescent Lamp Ballasts

Acme Electric & Manufacturing Co., Cuba, N. Y., is marketing the Quick-Start fluorescent lamp ballast, for use with instant starting lamps. Such ballasts eliminate the need for starters. The company now has such ballasts in the dual 40-watt size for either end lead or bottom lead designs. Operating from standard 115/120 primary circuits, the ballast boosts voltage to 450 volts for starting. Old type fixtures may be changed to take advantage of instant starting lamps by adding Quick-Start ballasts.

The loss of recoverable alloys in steel scrap has been a major problem confronting the various conservation agencies. Proper segregation of scrap is one effective answer.

Segregation of scrap at the source is comparatively simple. The difficulty comes in preventing mix-ups in subsequent handlings. They can be prevented or remedied by applying two simple tests—spark and spot.

The presence of molybdenum, or nickel, or both, is readily detected by spark testing. Molybdenum causes an easily recognized secondary burst at the end of the spark stream resembling a spearpoint. Nickel produces a spot of intensely white light in the stream near the grinding wheel.

Both elements have a tendency, in the higher contents, to suppress the supplemental bursts characteristic of carbon steels.

Several spot tests for molybdenum have been developed. The simpler ones depend on the red color produced by either potassium ethyl xanthogenate or sodium thiocyanate added to a molybdate obtained from the etched surface of the steel. The dimethyl glyoxime test for nickel also depends on a red coloration. Many of these tests are approximately quantitative.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company

500 Fifth Avenue · New York City

MOLY

"SIP" Hydroptic-B Jig Boring and Milling Machine Will Handle Precision Work in One Setting

Manufacturers in the United States, especially during the war, have used their Swiss jig borers to handle manufacture of high-precision parts for production as well as in the making of jigs and fixtures. However, it has been necessary for them to remove the piece from the jig borer for the milling operations, resulting in a sacrifice of accuracy as well as time.

So that drilling, reaming, boring and milling can be completed in one setting without harmful effect due to milling operations, and thereby permit all operations to be performed with the accuracy for which the SIP machines are known, a Hydroptic-B jig and boring and milling machine has been developed by the Societe Genevoise D'Instruments de Physique, Geneva, Switzerland.

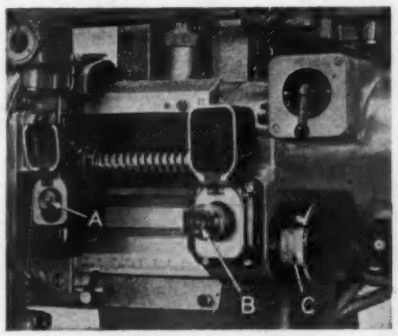
This machine is now available to American users through the Cosa Corporation, 5000-4 Chrysler Building, New York, which reports ability to make delivery in reasonable time.

Specification of the Hydroptic-B are as follows: work table surface, $39\frac{1}{2} \times 32$ in.; longitudinal table travel, $37\frac{1}{2}$ in.; distance between uprights, $39\frac{3}{4}$ in.; distance from table top to spindle end, 8 in. minimum, $28\frac{3}{4}$ in. maximum; transverse travel of spindle saddle, 28 in.; spindle taper, No. 4 Morse; spindle quill travel, 10 in.; spindle speeds, eighteen from 40 to 1250 r.p.m.; spindle feeds, six up and six down, 0.0016 to 0.01 in. per revolution; drilling capacity, to 2 in. in cast iron and $1\frac{1}{2}$ in. in steel; boring capacity, from $\frac{1}{2}$ to 9 in.; maximum diameter of cutter, $4\frac{3}{4}$ in.; motor, 4 hp.; floorspace, 108×898 in.; total height, 108 in.

Settings of the work table and the spindle head are guaranteed to 0.0002 in., and the user is assured that center distances can be held to 0.0003 in. and holes to 0.0004 in.

The measuring system is of a patented design new in application to Swiss jig borers. Because a measuring screw cannot be expected to impart feed to the table during milling cuts and still retain its accuracy, the table is driven hyraulically. For approximate settings, the table feed ranges from 0.2 to 2.0 in. per min.; for milling, the feeds range from 1 to 5 in. per min. Rapid traverse, up to 80 in. per min. The spindle saddle is traversed by an electric drive.

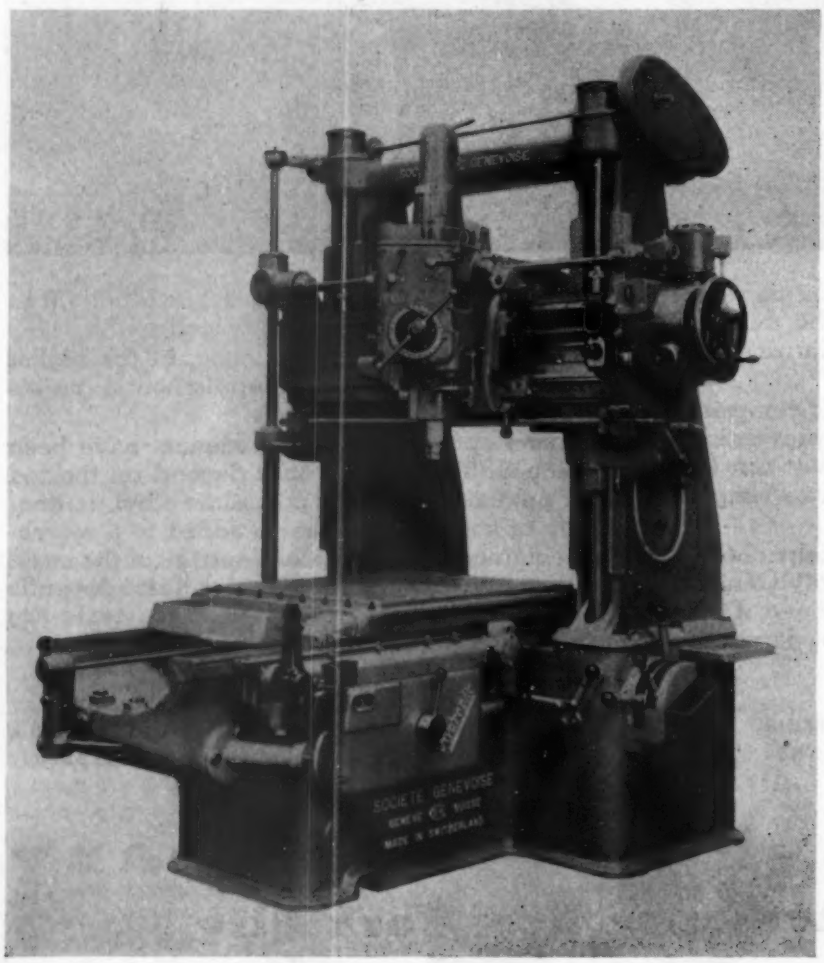
Optical setting systems are applied to the work table and spindle saddle. The scales, one for table settings and one for spindle cross settings, are graduated in 0.1 in., are fully covered, and they are integral with the table and saddle respectively. The scales are observed through microscopes built respectively into the bed and crossrail. In setting the spindle, for example, to a position 23.7416 in., the saddle is first moved rapidly by handwheel, until an index finger



Spindle head measuring device

lies between the divisions 23.7 and 23.8 upon an auxiliary scale fitted to the crossrail. Next the dividing drum which is graduated in 0.0001 in. is set to 0.0146 in. When the operator looks through the eyepiece, he sees a dotted line on the reticle in the neighborhood of a solid scale line. With the adjusting knob, the operator moves the spindle saddle until the two lines coincide.

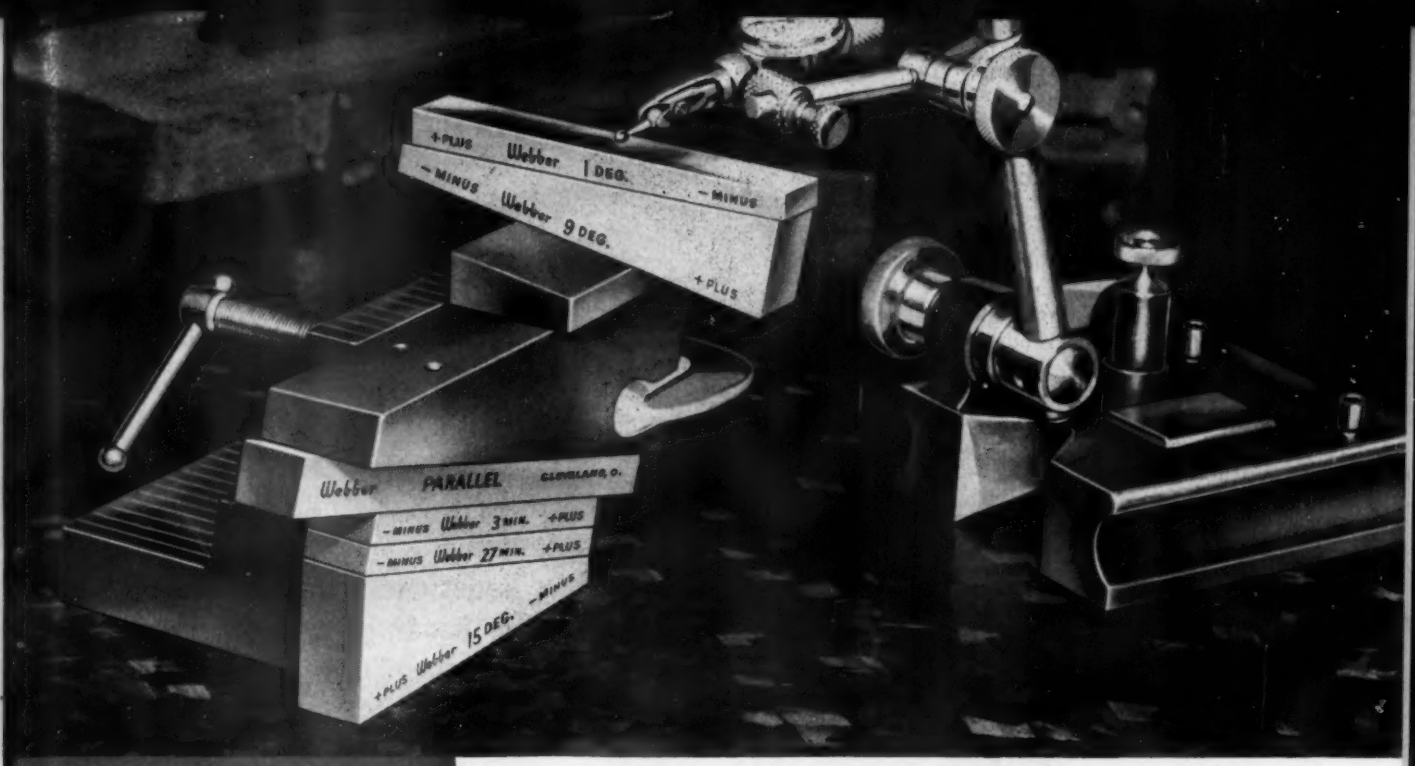
Accessories available include a precision circular dividing table, and tilting rotary tables accurate to ten seconds. High-precision boring tools and milling cutters are also available.



"SIP" Hydroptic-B jig boring and milling machine

Turco Solu-Gluv for Hands Prevents Penetration of Dirt

Solu-Gluv, a white cream that is rubbed into the skin, has been developed by Turco Products, Inc., 6135 South Central Ave., Los Angeles, Calif. When the cream dries on the hands it forms an invisible film to which grease, paint, cutting oils and dirt adhere. The film, plus accumulated dirt can be rinsed off in ordinary water. The cream is said to not interfere with the user's sense of touch.


+PLUS Webber 1 DEG. -MINUS
-MINUS Webber 9 DEG. +PLUS
Webber PARALLEL CLEVELAND, O.
-MINUS Webber 3 MIN. +PLUS
-MINUS Webber 27 MIN. +PLUS
+PLUS Webber 15 DEG. -MINUS

Compound Angles are easily measured with WEBBER *Angle Gages*

● The complexities of measuring compound angles are greatly simplified with Webber Angle Gage Blocks. Here you have as many as 370,800 angle measurements possible from a set of 14 blocks in steps of ¼ second of an arc.

Webber Angle Gage Blocks provide the easiest, quickest, most accurate method of measuring angles known today.

For example—the above illustration demonstrates the ease of measuring compound angles. The work piece has one 14 degree angle and an 8 degree angle running at right angles to it. The work is placed on a parallel which is wrung to the proper combination of blocks to form a 14 degree angle. This is checked by indicating across the top. Assuming this is correct you then wring together the proper blocks to form an 8 degree angle. These are placed on the 8 degree surface of the work. After squaring them and setting them at right angles to the first surface, the correctness of the 8 degree angle can be determined by indicating along the length of the gage blocks.

On very large pieces, the work can be left flat on the surface plate and proper angle gage blocks laid upon the angles to be checked with indicator readings then taken on the gage blocks.

For accurate measurements of all angles easily—quickly—use Webber Angle Gage Blocks.

Full descriptive bulletin upon request

Webber GAGE COMPANY

12901 TRISKETT RD. • CLEVELAND 11, OHIO

Continental Butt Welder Welds Forms up to 3/8 in.

Application of the bandsaw butt welder has been extended through the DoAll butt welder announced by Continental Machines, Inc., 1301 Washington Ave. So., Minneapolis 4, Minn. With this unit steel rods, steel tape, wire and wire forms up to 3/8 in. diameter are quickly welded. Extensions to drills, screw drivers and cutting tools can be made quickly by inexperienced operators.

Four simple steps complete the butt welding operation, including welding, annealing and grinding off flash. No adjustments are required to handle various sized welds. The unit is available in two styles, each having the same capacities. One is a table model, and the other is mounted on a pedestal.

DoAll butt welder

An electric etching attachment is available for operation with the butt welder. The attachment is clamped to one of the welding jaws, and can be used for marking tools and parts.

Hanson-Van Winkle Munning Electroplating Computer

An aid to the electroplater and plating chemist in the form of the Jernstedt electroplating computer, made available by Hanson-Van Winkle-Munning Company, Matawan, N. J. Among the things the instrument is said to do are: compute chemical additions required in a plating bath; indicate weight of metal deposited on unit area; list cathode efficiencies; give plating time required to deposit a given thickness of any metal; compute required current density and indicate thickness of deposit resulting from an established plating time at a known current density.

Taylor H-Eff mallet

Taylor H-Eff Mallets Have Shock Absoring No-Mar Heads

The Hi-Eff mallet in three weights is now available from Taylor Manufacturing Company, 3056 W. Meinecke Ave., Milwaukee 10, Wis. Although of different weights all heads are of the same size. The mallet head is of a shock absorbing material that hits hard without causing damage. It is said that the tool can be used on many finely finished surfaces as are encountered in automotive, radio, furniture and aircraft industries.

Thomas Machine Offers Redesigned Line of Bending Rolls in Four Sizes, for Bending Angles up to 6x6 in.

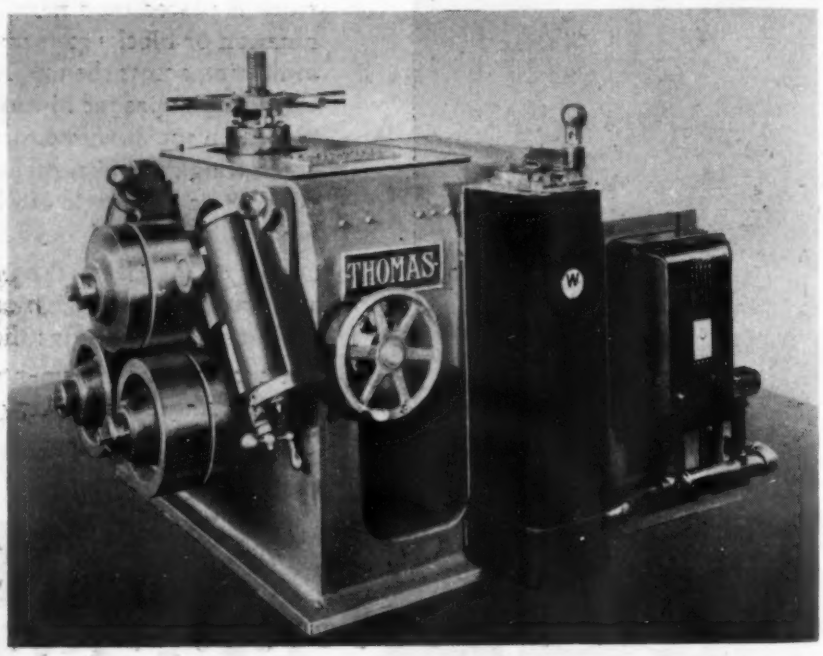
Special shapes of almost unlimited variety can be formed on bending rolls included in the redesigned line available from Thomas Machine Company, Pittsburgh, Pa. The new machines are available in four sizes, comprising rolls for bending angles 2×2, 3×3 and 4×4 in. in the vertical type machine, and for bending angles up to 6×6 in. in the horizontal type.

The new machines are of all steel construction, with cast steel bearing housings welded into place. Bearings are bronze bushed and lubricated with high pressure fittings. Vertical type machines have horizontal shafts and bend material in a vertical plane. The motor and reduction gear unit is mounted on an extension of the main frame so the machine is entirely self-contained above the floor level.

Horizontal type rolls have the rolls on vertical shafts and roll the material on a horizontal plane. Machines are driven through a fully enclosed speed reducer, all shafts being mounted in anti-friction bearings, located in a pit below the floor.

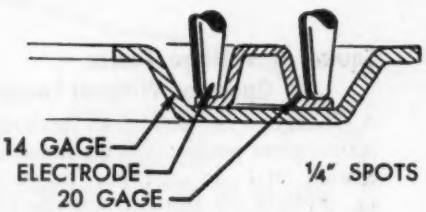
A feature of all these machines is an adjustable auxiliary roller which counteracts twisting and keeps the leg of the angle square when rolled leg in. When angles are rolled leg out, this roller serves as a gage to indicate when the proper diameter is rolled. It can also be used for enlarging circles which have been rolled too small.

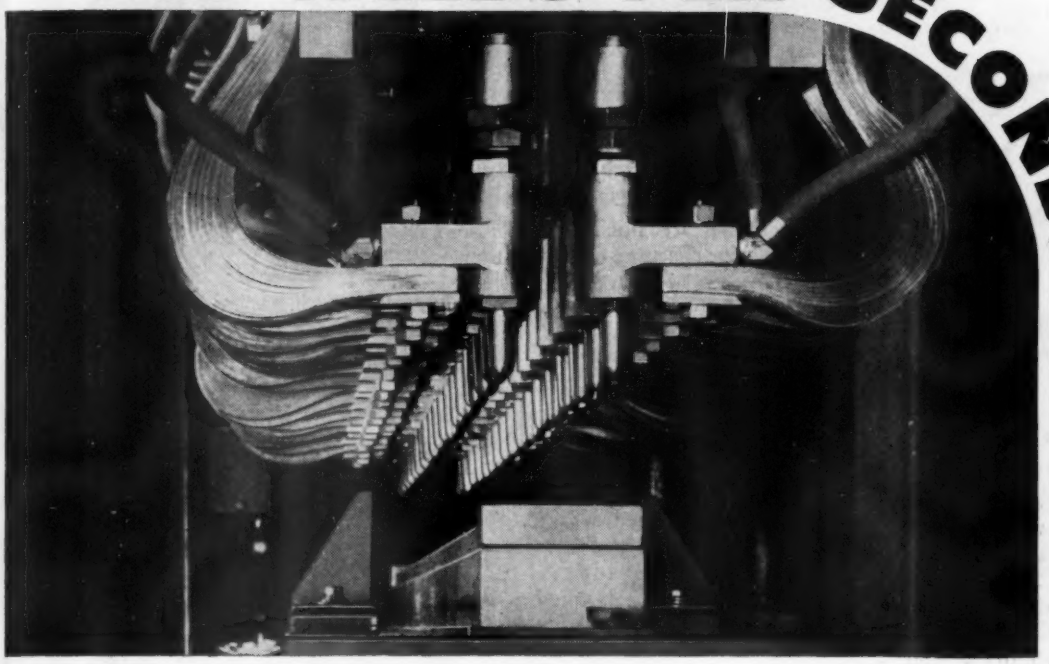
All three roll shafts are power driven, enabling small diameters to be rolled with a single pass.



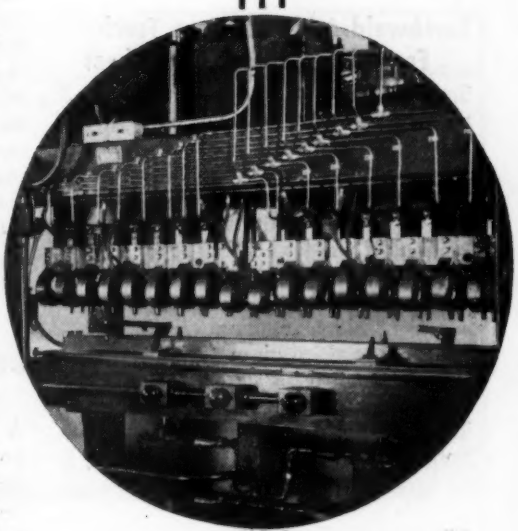
Thomas vertical bending roll

4 WELDS PER SECOND





One reason why spot-welding is making such phenomenal gains as a universal fabrication process is the time and cost-saving speed with which welding operations can be performed. The example here — welding a steel beam assembly five feet long and six inches wide out of a combination of 14 and 20 gage steel—on a Progressive Hydromatic welder is not an exceptional case. Quick acting clamps on the fixture provide locating of the two members of the beam assembly. The center of the table is raised under air pressure from two cylinders below the table against the standard interchangeable PWC hydraulic guns. Once the machine is started by pushing a button, it automatically goes through its complete cycle making 36 welds, 18 to a row, in just a few seconds; the 1/4 inch spots being welded two at a time (in series, electrically). The table is lowered and the completed assembly is removed. Even the amount of heat to different welds is varied automatically to compensate for decrease in welding current due to short-circuiting effect and varying of secondary loop, as more and more welds are completed.



PROGRESSIVE WELDER CO.

SEAM PROJECTION & BUTT • *Electric Welding Equipment* • PORTABLE GUN & PEDESTAL

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Square D Voltage Tester Operates Without Lamps

A voltage tester that tests without lamps, gives positive voltage indentification and distinguishes between a.c. and d.c. is being manufactured

Square D voltage tester

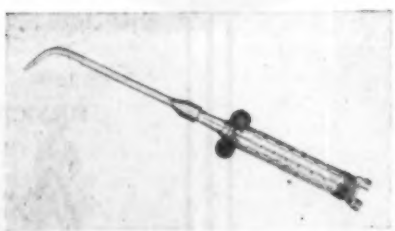
by Square D Co., 606 Rivard St., Detroit 11, Mich. A.C. voltage markings are 110, 220, 440 and 550 while d.c. markings are 125,250 and 600.

Frequencies can be determined by vibrations of the indicator. The device is housed in a cylindrical fibre case and is practically unbreakable. Sharp spear points on the ends of leads permit piercing of wire insulation for testing without damaging it.

Torchweld Adds Compact Torch For Use on Light Metal Sheet

Specially designed for use on aircraft tubing, aluminum, various alloys and sheet metal up to ¼ in. thick is the new Aircrafter torch added to the line of Torchweld welding and cutting equipment manufactured by the National Cylinder Gas Company, 205 W. Wacker Drive, Chicago 6, Ill. The torch weighs only 8 4/5 oz., complete with a common size tip, and has an overall length of 12 in.

The Aircrafter is suited to delicate, precision work on hard to reach areas. Two types of tips are offered and both can be swiveled to any position.



Aircrafter welding torch

University surface standards

University Surface Standards For Roughness Comparison

A set of surface finish comparison standards for checking surface roughness is offered by University Machine Co., University Road, Cambridge 38, Mass. The set is composed of 23 specimens with a roughness range from two millionths of an inch. to 500 millionths of an inch. Blocks are made of steel and include representative specimens of all ordinary machine tool operations. Each specimen is engraved with the machine operation and micro inch reading. They are packed in separate compartments in a felt lined walnut case.

Park Oil Accelerator Speeds Action of Ordinary Quench Oil

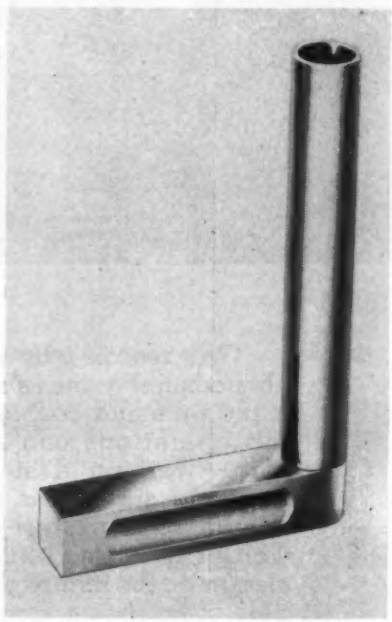
Ordinary quenching oils can be stepped up to performance levels of fast quenching oils by addition of Park quench oil accelerator, according to its makers, the Park Chemical Co., Military at Bourg St., Detroit, Mich. By adding accelerator in a ratio of one to four to oil in a system, the viscosity, flash and fire points of the oil are raised slightly while cooling rates for steel are definitely increased. The accelerator is not claimed as a substitute for new quick action oil.

Gibbons Makes Taeco Hoods To Protect from Mist, Vapors

A lightweight, air-supplied hood to protect workers in paint, chemical, metallizing and allied industries is being manufactured by Wesley A. Gibbons Co., Birmingham, Mich. Called the Taeco hood, it guards eyes, ears, neck, face and respiratory organs from harmful mists, vapors, fumes and dusts. The pliable hood weighs only slightly more than an ordinary hat and permits free body movement.

Compressed air at low pressure is supplied to the hood through a distributing tube, which is held in place at the operator's waist by a belt clip. Two models are offered, the Vapo hood for use when spraying paint and other liquids, and the Fumo hood for industries where irritating dusts or fumes are prevalent.

Taeco air hood

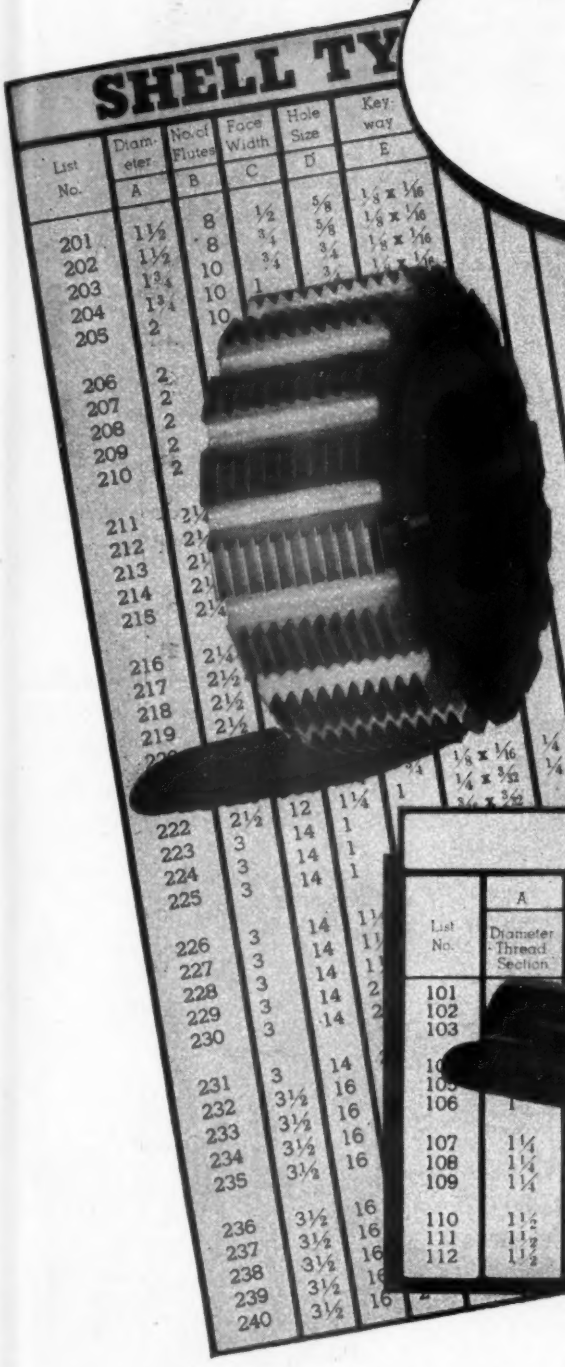


Ellstrom master square

Dearborn Gage Introduces The Ellstrom Master Square

The Ellstrom master square, made by Dearborn Gage Company, 22038 Beech St., Dearborn, Mich., is made in such a way that normal life of such a unit is increased many times. The upright member is a cylinder, screwed to the base. As wear develops, a fresh new surface can be brought into use by loosening the screw and turning the cylinder slightly. All surfaces of the square are hard chrome plated and lapped to a finish accuracy of 10 micro inches. Sizes start at 4-in., (upright measurement from base surface) and can be obtained in larger dimensions as desired.

HOW TO GET THREAD MILLING CUTTERS *Faster*



SHELL TY

List No.	Diameter A	No. of Flutes B	Face Width C	Hole Size D	Keyway E
201	1½	8	½	⅝	⅛ x 1/16
202	1½	8	¾	⅝	⅛ x 1/16
203	1¾	10	¾	¾	⅛ x 1/16
204	1¾	10	1	¾	¼ x 1/16
205	2	10			
206	2				
207	2				
208	2				
209	2				
210	2				
211	2¼				
212	2¼				
213	2¼				
214	2¼				
215	2¼				
216	2¼				
217	2½				
218	2½				
219	2½				
222	2½	12	1¼	1	¼ x 3/32
223	3	14	1	1	¼ x 3/32
224	3	14	1	1	¼ x 3/32
225	3	14	1	1	¼ x 3/32
226	3	14	1¼	1¼	¼ x 3/32
227	3	14	1¼	1¼	¼ x 3/32
228	3	14	1¼	1¼	¼ x 3/32
229	3	14	1¼	2	¼ x 3/32
230	3	14	1¼	2	¼ x 3/32
231	3	14	1¼	2	¼ x 3/32
232	3½	16	1¼	2	¼ x 3/32
233	3½	16	1¼	2	¼ x 3/32
234	3½	16	1¼	2	¼ x 3/32
235	3½	16	1¼	2	¼ x 3/32
236	3½	16	1¼	2	¼ x 3/32
237	3½	16	1¼	2	¼ x 3/32
238	3½	16	1¼	2	¼ x 3/32
239	3½	16	1¼	2	¼ x 3/32
240	3½	16	1¼	2	¼ x 3/32

Order by

STOCK BLANK NUMBER

giving Pitch and Thread Form desired

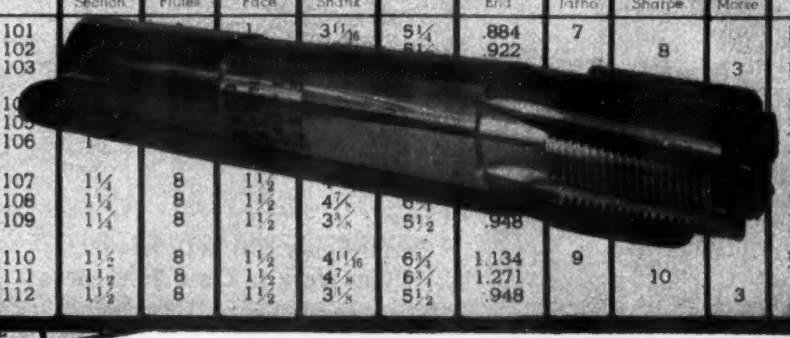
•

DETROIT

STANDARD STOCK BLANKS MEET 90% OF ALL THREAD MILLING CUTTER REQUIREMENTS

SHANK TYPE

List No.	A Diameter Thread Section	B Number of Flutes	C Width of Face	D Length of Shank	E Length Overall	F Shank Diameter Large End	G Shank Taper: Jarno	G Shank Taper: Brown & Sharpe	G Shank Taper: Morse	H Drawbar Threads
101				3 11/16	5¼	.884	7			½-13NC
102					5¼	.922		8		⅝-24NF
103									3	½-13NC
104										½-13NC
105										⅝-24NF
106	1									½-13NC
107	1¼	8	1½							½-13NC
108	1¼	8	1½	4⅞	6¼					⅝-24NF
109	1¼	8	1½	3⅛	5½	.948				½-13NC
110	1½	8	1½	4 11/16	6¼	1.134	9			½-13NC
111	1½	8	1½	4⅞	6¼	1.271		10		⅝-24NF
112	1½	8	1½	3⅛	5½	.948			3	½-13NC



FOR STANDARD STOCK SIZES, ASK FOR BULLETIN No. CB-43

BUY U.S. BONDS STAMPS

DETROIT TAP & TOOL CO.

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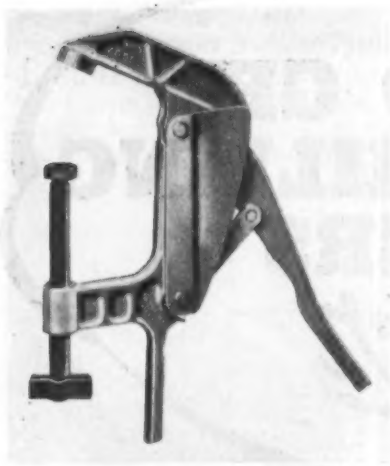
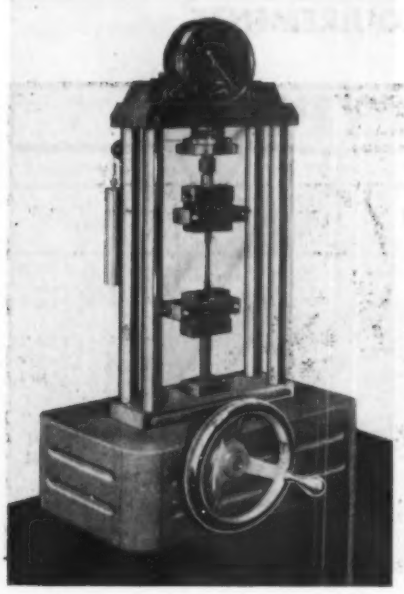


Knu-Vise C-clamp

Knu-Vise C-Clamp is Made Stronger, Lighter in Weight

The model 505 C-clamp, made by Knu-Vise, Inc., Eighth and Plum Sts., Detroit, Mich., is said to be stronger, lighter in weight and have greater throat capacity than former C-clamps. A wing nut replaces the knurled head on the spindle which adjusts the gap for the required thickness of work. Once set, the clamp remains at that exact setting, without unscrewing between clampings.



Dillon tensile tester

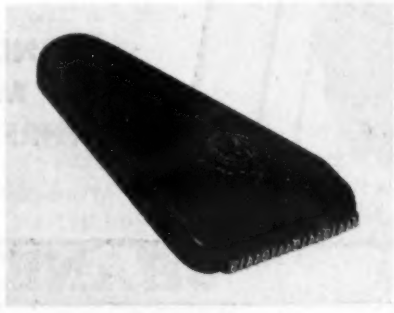
Dillon Makes Tensile Tester In Compact, Portable Model

A small, portable tensile tester that can be used readily by comparatively inexperienced help is now being made by W. C. Dillon Co., 5410 W. Harrison St., Chicago 44, Ill. The standard unit stands 37 in. high and weighs less than 170 lb. Tension up to 10,000 lb. can be applied through a counter-balance handwheel.

Features include: interchangeable dynamometers, for seven different loading ranges; standard tensile gripping jaws; provision for motorization of handwheel and double-keyed drive screw. Distance between platens is 21½ in., minimum jaw separation 0 in., and maximum jaw separation 9 ¾ in.

Matthews Sure-Set Holder For Synthetic Etching Type

Jas. H. Matthews & Co., 3942 Forbes St., Pittsburgh 13, Pa., has developed the Sure-Set holder for use with its S-22 synthetic etching type and logotypes. The acid resisting plastic holder is used for setting up markings which require a single line of characters. Three sizes of holders are available, No. 1 for characters 3/64 to ⅛ in. high; No. 2 for characters 5/32 to 5/16 in. high, and No. 3



Matthews Sure-Set holder

for characters ⅜ to ½ in. high. Type for these holders, regardless of character size, is of 12, 24 and 42 point body size respectively. All holders are approximately 3 in. in length. Type cannot fall out of ends of the holder.

Porter-Cable Wet Belt Grinder Can Work to Close Tolerances

Demands for a wet belt grinder with greater coolant capacity and rigid construction for grinding accuracy resulted in development of the Model AG-8 machine by Porter-Cable Machine Company, Syracuse, N. Y. This model is equipped with a 35-gal. self-contained recirculating pump system.

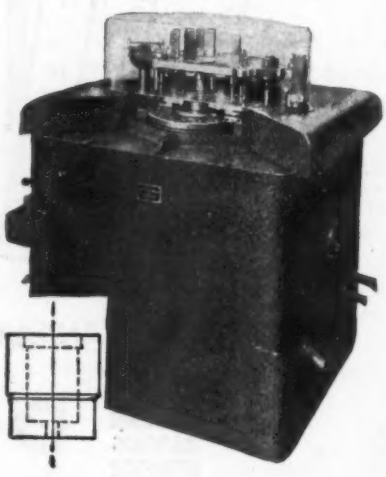
Tolerances to 0.0005 in., are said to be possible with the machine, even when used by inexperienced operatois. Features include: an accessible waste clean-out drawer; joggle type switch; high table; flexible tubing to spot coolant and greater platen grinding area.

Porter-Cable wet belt grinder

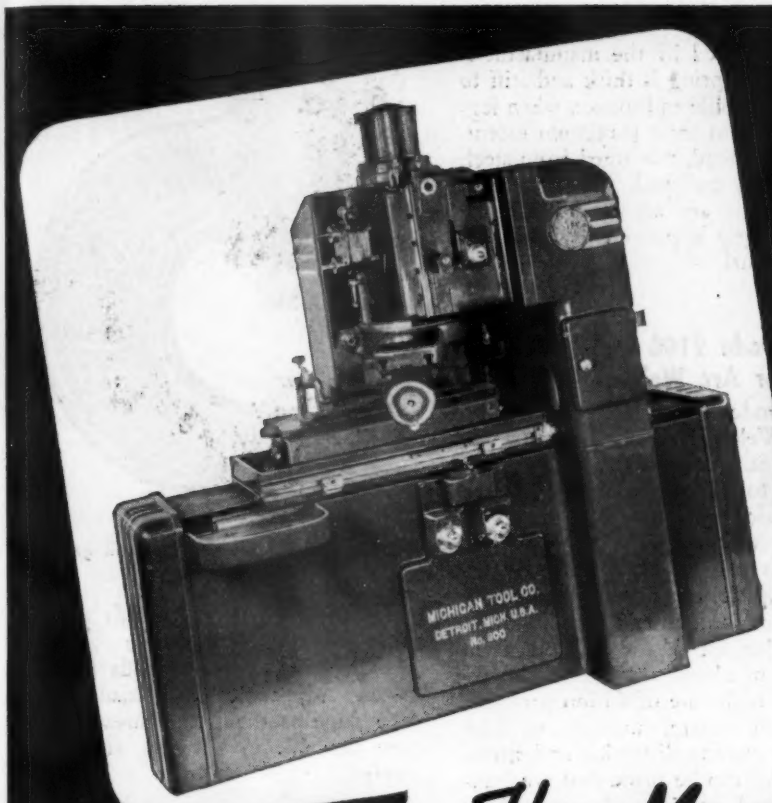
Interlakes Makes Machine For Automatic Inspection

The Check-Matic, a machine for automatically inspecting parts up to 1½ in. in diameter and 2 in. high has been developed by Interlakes Engineering Company, 502 Transportation Bldg., Detroit 26, Mich. The machine will check go and no-go on such dimensions as inside and outside diameters, depth of counterbore, wall thickness and depth of holes, all to limits of 0.001 in.

Parts to be inspected are placed in



Interlakes inspection machine



The Machine that's
NEVER BEEN LICKED

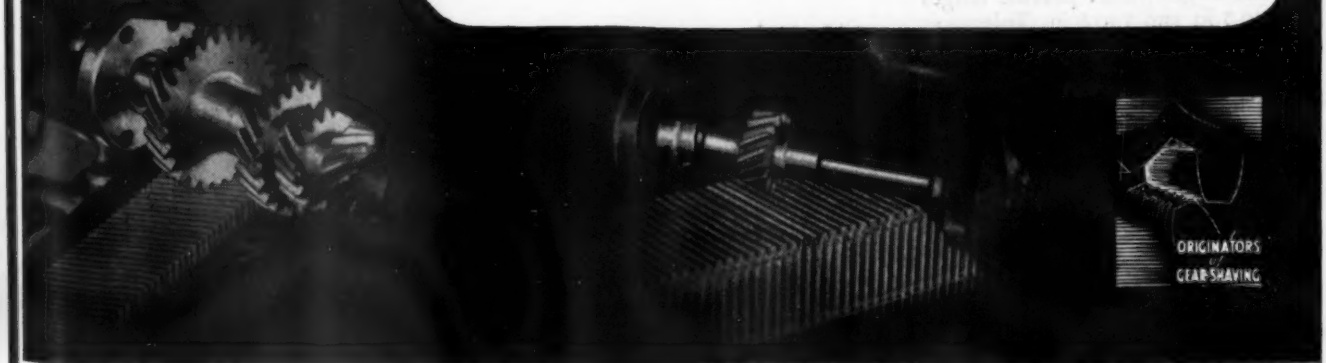
For either spur or helical gears, where day in and day out output really counts, where cost per piece is important, where accuracies *must* be maintained over long runs, even "Michigan" itself has not been able to "lick" the rack type gear finishing machine. The best we have been able to do is improve the machine for even greater accuracy in production, greater flexibility, better ease of adjustment and faster operation.

Fundamentally however, the Series 900 Michigan gear shaver operates on the same principle—generating gears from a basic rack—that it did when it first revolutionized gear manufacturing methods. This most accurate of generating methods permits the production of accurate gears by the millions at a *lower* cost than for less accurate gears.

Designed for mass production of spur or helical gears, splines, etc. ranging up to 8 inch diameter and 2 inch face width.

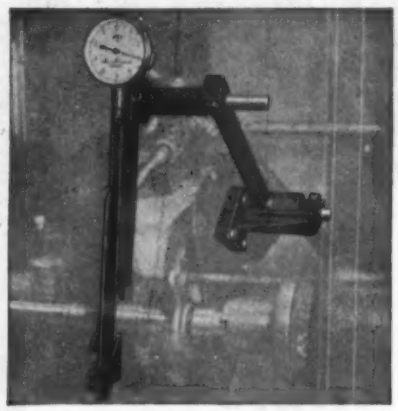
MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD • DETROIT 12, U. S. A.



the holes of the machine's revolving dial which carries them to the various gages. If a part does not meet any test it is automatically rejected. Each gage has its own rejection tube, so parts are sorted as to the inspection they fail to pass.

The standard model has an 18-hole dial and is equipped to check as many as 13 individual dimension. Gaging elements and bushings can be changed quickly for the inspection of parts of different shapes and dimensions.



Stuart Micromatic gage

Stuart Micromatic Gage Is Aid to Precision Grinding

The Stuart Micromatic gage, distributed exclusively to the automotive industry by Clawson & Bals, Inc., 4701 W. Lake St., Chicago, Ill., is said to aid in attaining accuracy in precision grinding and add to speed of such work. The gage is applied to work while the machine is in operation and is claimed to eliminate hand miking. A dial indicator guides the operator as work is ground to size.

The Micromatic gage has no gears, levels or angles. The dial is actuated by direct parallel thrust. Contact points of the caliper measuring bar as of tungsten carbide. The gage is made in two models with ranges of from $\frac{1}{8}$ to $1\frac{1}{4}$ in., and $\frac{5}{8}$ to $2\frac{1}{2}$ in., respectively. Additional calipers for the larger model provide ranges of 2 to 5 in. and 5 to 8 in. Tolerances to 0.0001 in. are easily held.

Nork Toolmakers' Dividers Have Replaceable Needles

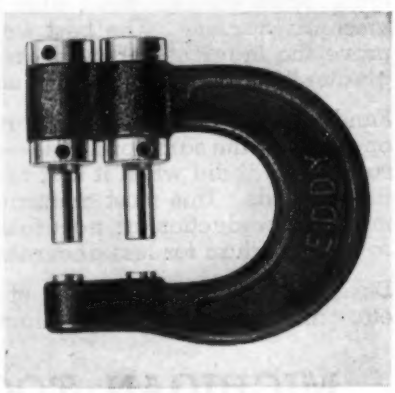
Toolmakers' dividers with replaceable alloy steel needle points are being manufactured by Nork Products Co., 5897 South Main Street, Los Angeles 3, Calif. Needle points used are the same as are used in other tools marketed by the manufacturer. The tool's spring is thick and stiff to prevent wobble and torsion when legs are spread to their maximum extent. Legs are round, machined from steel, and highly polished. Screw and adjusting nut are accurately threaded and the grip is provided with a precision knurl.

EutecTrode 2100 Developed For Arc Welding Aluminum

EutecTrode 2100, developed by Eutectic Welding Alloys Company, 40 Worth St., New York, N. Y., is expected to have a wide use in the reclamation of aluminum castings by the arc welding process. With this rod it is possible to add metal without completely preheating the casting. Operation is rapid and economical.

Another use of the electrode is in joining of aluminum sheet. The extremely high rate of fusion produces a smooth, strong, homogenous fillet without causing distortion and stresses. Joints can be made that are leakproof and machineable and show tensile strength comparable to the parent metal.

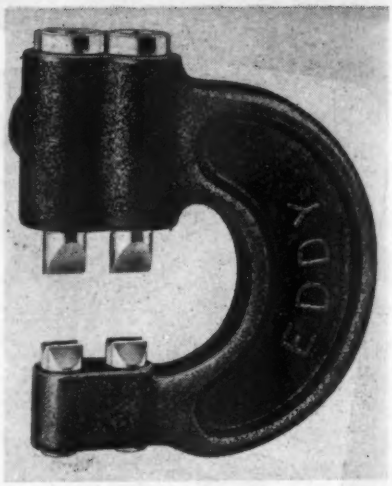
The rod is shielded with a special coating which permits its application without preheating. EutecTrode 2100 is available in $\frac{1}{8}$, 5/32 and 3/16 in. sizes, packed in containers of 25 lb.



Eddy adjustable gage

Eddy Makes Two Types of Small Adjustable Gages

Eddy Manufacturing Co., 321 Pine St., Pawtucket, R. I., are marketing new models in two types of gages—adjustable, and adjustable screw thread gages. The adjustable screw thread gages are provided with three adjustments so that with the addition of two extra rods and anvils it can gage all thread sizes from 0 to $\frac{5}{8}$ in O.D., and all American Screw Thread



Eddy adjustable screw thread gage

sizes from 10 to 32 threads per in. Gages are available in five sizes and five styles, and gaging rods in nine sizes. Adjustable gages, made much the same as the screw thread gages are available in 15 sizes, and three styles.

United Makes Master Collet Chucks in Larger Capacities

Master collet chucks, in larger sizes than heretofore offered are now available from United Industries, 8344 Second Blvd., Detroit 2, Mich. The line includes four standard sizes: $\frac{3}{4}$, 1, $1\frac{3}{4}$, and $2\frac{3}{4}$ in. round, but special larger sizes without limits as to dimensions are also available.

This collet chuck is said to be adaptable to any operation requiring the use of a chuck—on lathes, screw machines and grinders. Actuated by hardened steel balls, the collet produces a powerful gripping action. The hand lever engages or releases the collet without stopping the work head.

Master collet chuck

FIRST LINE OF FIGHTING STEEL

Batteries of open-hearth furnaces in the steel mills of America produce most of the steel for the attack. For the open-hearths are the first line of steel production — and steel is the spearhead of invasion.

New skills and new methods in open-hearth operation contribute to the record-breaking steel production that arms our men and our allies and affords protection to their lives as well.

This greater open-hearth tonnage of new carbon steels, with properties approaching the alloys, holds high promise for peacetime application in great abundance that will enrich life and enlarge daily living.

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH, PENNSYLVANIA

J&L STEEL

CONTROLLED QUALITY STEEL FOR WAR

THE OPEN HEARTHS

Bigger than 8-room house, a modern open hearth steel furnace, enclosed in silica brick, produces 150 to 200 tons of molten steel every 10 to 12 hours. The furnace is first charged with limestone, then scrap iron, eventually pig iron or molten iron, and other ingredients. For hours the "bath" melts, bubbling and boiling at temperatures up to 3,000°F., is worked, watched and tested by skilled crews, vigilant to maintain control of quality.

Samples of the steel bath are taken at intervals and laboratory tested to make sure analysis of the steel is correct for the job it is to perform—perhaps on a far away battle front. Experienced open-hearth melters and helpers, by merely looking at a fractured steel sample, can judge carbon content to within 3/100 of 1%. In this they are now assisted by a magnetic device in a small box which reveals carbon content on a dial. This is the "Carbanalyzer," a J&L invention.

Through tap hole in rear wall the "heat" of molten metal is drawn off into great ladles in pits below. As these are filled, protectively garbed skilled workmen on the tapping platforms amidst heat and sparks, throw in measured quantities of manganese, silicon and other final modifying ingredients (see illustration) to obtain exact analysis of steel desired.

Wispy vapors tinted lavender, chartreuse, pink, blue, yellow, arise as the fiery stream of steel gurgles and splashes until ladle is full, and steel sparks shower about, popping and bouncing as they hit the ground. Overhead crane now picks up the sputtering brimful ladle and bears it away to fill the rows of ingot molds standing close by on low-built buggies (small flatcars).

Greatest steel producers of all time, open hearth furnaces, from which streamed last year in the U. S. 78,625,857 tons of steel ingots, were invented by Charles William Siemens, of Hanover, Germany, who became citizen of England to obtain protection of its patent laws. He patented his furnace in 1861 and perfected it in 1867, a dozen years after Henry Bessemer's process had revolutionized steel making.

Two brothers in France, Emil and Pierre Martin, experimenting in the 60's to further improve steel-making methods, utilized a Siemens furnace to produce steel by melting scrap iron in bath of molten pig iron. This became known as the Siemens-Martin process; is substantially the process used today.

A Cleveland ironmaster, Charles A. Otis, founder of Otis Steel Co., in association with Samuel F. Wellman, engineer, of New York, in 1873 built first complete steel works in U. S. planned exclusively for production of steel by the acid open hearth process. In 1880 Wellman built for Otis first basic open hearth steel furnace in U. S. (Basic differs from acid process.) Otis Works, Cleveland is now one of Jones & Laughlin's big steel plants—others are in Pittsburgh and Aliquippa, Pa.

Parts and Materials

Electronic Products Develops Welding Timers and Contactors

Electronic Products Company, Geneva, Ill., is marketing two new electronic timers and contactors for spot welding and other timing applications. Series A timer is suited to all short time operations of 45 cycles or less and series B timer contactor has given time control from ½ cycle to 45 cycles. The latter is also an electronic contactor for load up to 15 demand kva, while the series A unit may be used as a contactor for any load of ½ kva, or less. They are easily applied to any make welder, through a few simple wiring changes.

Electronic Series A timer

Sterling R-851 Insulating Varnish Is Highly Flexible

R-851 flexible insulating varnish being offered by the Sterling Varnish Co., 105 Ohio River Blvd., Haysville, Pa., is designed for applications that require great lead wire flexibility and high mechanical strength. The varnish is said to dry completely through when baked at a temperature of 135 C. and be oilproof and water, acid and alkali resistant. It is recommended for electrical equipment wound with glass covered wire, designed to operate at exceptionally high operating temperatures.

Standard Air-rester

Standard Air-rester Used On Grinders and Polishers

The Standard Electrical Tool Co., 2480 W. Sixth St., Cincinnati 4, Ohio, offer the Air-rester self-contained dust collector for use with all types of grinding, buffing and polishing equipment. Units are available in four sizes, with capacities from 300 c.f.m. to 1,200 c.f.m.

The motor driven fan is located in the lower compartment and the upper, dust-collecting chamber is fitted with flame-proof steel pads for filtering air. Air returns to the room without perceptible dust, at low velocity.

Michigan Chrome Markets Plating Stop-Off Lacquer

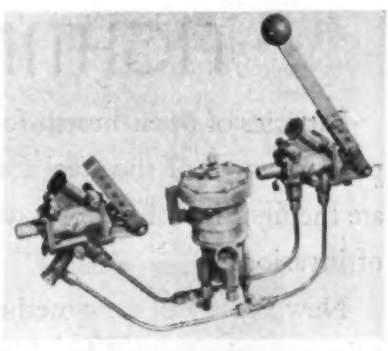
Specifically developed for masking of parts for hard chrome plating is a new stop-off lacquer being offered by Michigan Chrome and Chemical Co., 6340 E. Jefferson Ave., Detroit, Mich. The lacquer, known as Miccrome, can be applied by brushing, dipping or spraying and provides a smooth even coating. It requires no forced drying and adheres to surfaces which have been chrome plated.

After plating, Miccrome can be peeled or dissolved. Removal from hard-to-reach spots is achieved by hot soaking and then blowing the remaining material off by use of compressed air. The material is said to have high dielectric strength, which helps provide accurate control of deposit and results in less loss of current. It is clear red to give definite contrast against exposed surfaces. Because of ease of removal, clean-up time is reduced to a minimum.

Adel Announces Changes in Isodraulic Remote Controls

Adel Precision Products Corp., Burbank, Calif., have eliminated the diaphragm and auxiliary chamber of the equalizer unit from the Isodraulic remote controls, which they manufacture. These changes are said to simplify design and the servicing of the system. Synchronizing screws bypassing the pistons of the "master" and "slave" units permit bleedings and filling the system at one point without breaking any line connections, and provides rapid indexing of lever positions.

The two-line system provides smooth response at the slave unit to motion in either direction initiated at the master. Control units are now available with or without an integral lock, which in the slave unit of the irreversible system, maintains the selected position against load and vibration.



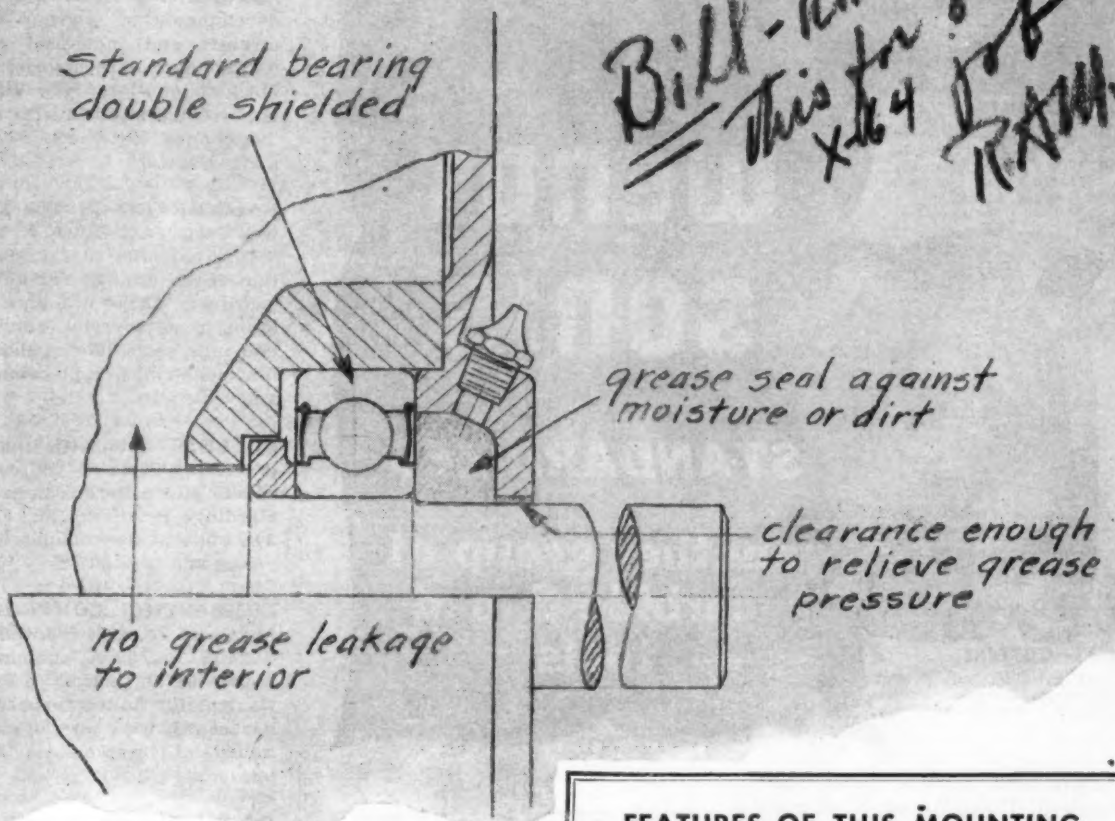
Adel Isodraulic control

The Isodraulic control system is immune to temperature effects, operating in temperatures ranging from +160 F. to —65 F. The unit can be mounted in any position and at varying elevations. Total weight of the complete assembly is less than 3¾ lb.

SUBJECT: Ball bearing mounting with infiltration lubrication and protection against overgreasing

COMMENTS: Very effective for electric motors, also many other applications.

Bill - how about this for our x164 job RAM.


Standard bearing double shielded
grease seal against moisture or dirt
clearance enough to relieve grease pressure
no grease leakage to interior

Naturally New Departure is concerned with getting maximum bearing production for the various forces that will bring the war to a successful conclusion.

But none should forget that after a bearing is produced, its success depends on *how* it is applied.

Perhaps you, like Bill, need a mounting for a certain job. Here is one which experience has proved to have many advantages for electric motors and numerous other applications.

New Departure Engineers will be glad to help you with any bearing problems you may have.

FEATURES OF THIS MOUNTING

1. *Takes standard width shielded ball bearing as produced by most ball bearing makers, thereby eliminating complications in supply or replacement.*
2. *Bearing definitely protected from danger of overgreasing, yet double shielded bearing receives adequate lubricant by infiltration from adjacent grease supply as thoroughly proved in service.*
3. *Grease from bearing housing is kept out of motor interior and windings.*
4. *Bearing is thoroughly protected from contaminents of all kinds.*
5. *Bearing remains self-enclosed and protected from dirt if motor is disassembled.*
6. *Mounting is effective in any position from horizontal to vertical.*

NEW DEPARTURE
BALL BEARINGS

3268

NEW DEPARTURE • DIVISION OF GENERAL MOTORS CORPORATION • BRISTOL, CONNECTICUT

Sales Branches: DETROIT, G. M. Bldg., *Trinity 2-4700* • CHICAGO, 230 N. Michigan Ave., *State 5454* • LOS ANGELES, 5035 Gifford Ave., *Kimball 7161*

SHELL END MILLS

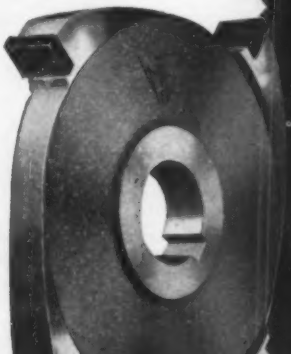
Tool No. SEM for cast iron and non-ferrous materials. Tool No. SSM for cutting steel. Sizes: 1¼" to 6". 4 to 10 teeth. Use up to 20" table feed per minute.

Again

WENDT SONIS

STANDARDIZES

another group of carbide tipped tools



MILLING CUTTERS

Five tool styles for milling steel and non-ferrous materials. Diameters: 3" to 8". 4 to 10 teeth.

They're here! They're New! They're Standard! These Wendt-Sonis cutting tools are especially designed carbide tipped cutting tools—not adaptations of high speed steel designs.

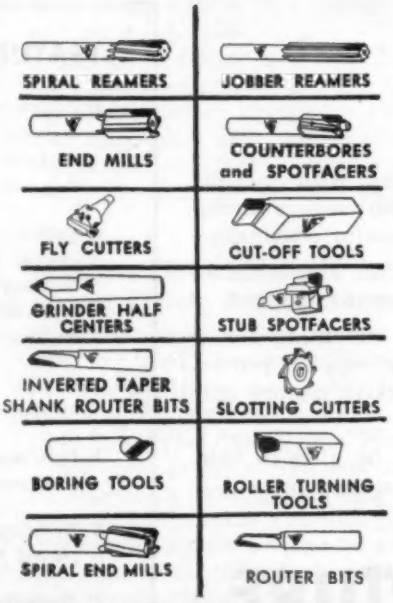
DISTINCTIVE CHARACTERISTICS—

1. **New flute angles**
2. **New fillet designs**
3. **New shank designs**

—**plus** 25% longer carbide tips on all round tools. All these new tools—many of which were formerly classed as "special" are now standard and listed in new W-S Catalog No. 144. Order through your nearest Wendt-Sonis distributor . . . or write to WENDT-SONIS COMPANY, Hannibal, Missouri or BRANCH WAREHOUSE, Long Beach, Calif.

NEW!

W-S Catalog No. 144 just off the press. Contains all new standardized tools and latest prices. WRITE TODAY for your FREE copy.



WENDT SONIS

CARBIDE TIPPED CUTTING TOOLS

BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS • DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING CUTTERS • REAMERS • ROLLER TURNING TOOLS • ROUTER BITS • SPECIAL TOOLS

TRADE PUBLICATIONS

AIR CONDITIONER Bard Mfg. Co., Bryan, Ohio, has published brochures giving full information on gas-fired and oil-fired air conditioning units, including features, sizes and other pertinent specifications.

AIRCRAFT PARTS The story of the development of a group of advanced aircraft and industrial products by Simmonds Aerocessories, Inc., 30 Rockefeller Plaza, New York 20, N. Y., is presented in an illustrated brochure, "Simmonds Products Fly with Famous Planes."

BALL BEARINGS The Marlin-Rockwell Corp., Jamestown, N. Y., has available a portfolio containing a compilation of material on the subject of ball bearings. There are 27 separate bulletins in all covering handling, shafts, housings, seals, lubrication, mountings, fits, snap-rings, replacement bearings and lock nuts.

COLLETS A bulletin illustrating and describing Style "S" Sure-Grip Master collets and pads has been released by Hardinge Brothers, Inc., Elmira, N. Y. The bulletin also includes a table of list prices and capacities.

COMBUSTION CONTROL Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia, Pa., have announced Catalog N-01P-163, on their Type P Combustion Control for boiler furnaces, for those concerned with the operation of an industrial power plant or small central station.

COMPRESSORS Form 1502, a 32-page catalog of compressors and vacuum pumps in sizes from ½ to 10 hp., has been released by Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y. In addition to their Type "30" line of air-cooled machines, it also includes a 3-stage dual-pressure portable and two 3-stage high-pressure units, designed particularly for use at airports in servicing and repairing airplanes.

DEGREASING Those concerned with industrial solvents and degreasing will find helpful information contained in a manual on vapor degreasing just published by the Phillips Mfg. Co., 3475 Touhy Ave., Chicago 45, Ill. Written in question-and-answer form, this book covers such subjects as work that can be handled by vapor degreasing, recovery of solvents, toxicity, and other such problems.

ELECTRIC DRILL The Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago 6, Ill., has published a brochure, "Tools to Build the World of Tomorrow," which covers the history, development, features and specifications of the recently introduced Thor plastic-housed, portable electric

drill. The booklet also presents an interesting exposition of the growing application of the use of plastics for industrial purposes.

ELECTRONIC CONTROLLERS Bulletin No. B220, offered by The Bristol Co., Waterbury 91, Conn., describes a new line of Free-Vane electronic controllers for automatically controlling temperature, pressure, liquid level and humidity, and includes wiring diagrams, principle of operation and general description and features of the new instruments.

FASTENERS The American Institute of Bolt, Nut & Rivet Mfrs., 1550 Hanna Bldg., Cleveland 15, Ohio, has commenced publication of "Fasteners," a magazine which will be sent regularly to operating executives and design engineers upon request. Vol. 1, No. 1 contains articles on screw threads, rivets and other fastening devices, together with a digest of current information on fasteners from various business papers.

FITTINGS A complete line of installation accessories for lubrication, hydraulic, steam, liquid and air applications is presented in Catalog No. 17-A which may be secured from the J. N. Fauver Co., Inc., 49 West Hancock Ave., Detroit 1, Mich. Photos, sizes, part numbers, specifications and prices of these items are also included.

FOOD BARS Albert Pick Co., Inc., 2159 Pershing Road, Chicago, Ill., have released a booklet covering their complete line of PIX rolling food bars and commissary kitchens. In addition to a description of each model, the booklet includes a page of typical menus and photos of these bars and kitchens in operation in various companies.

GAGES Two folders, one on adjustable gages and the other on adjustable screw thread gages, have been issued by the Eddy Mfg. Co., 321 Pine St., Pawtucket, R. I. They are complete with photos, sizes, specifications and prices.

GAGE BLOCKS "Ultra-Finish," a new processing method, for gage blocks is described by the Fonda Gage Co., Stamford, Conn., in an illustrated bulletin which lists the Fonda standard line of gage blocks, including Metric sets.

GROMMETS The new Dura-Grom, a fume and water-tight, vibration-proof unit for supporting lines through a firewall or bulkhead, is featured in a bulletin offered by Arens Controls, Inc., 2253 South Halsted St., Chicago 8, Ill. The bulletin gives full data on models available, specifications, applications and features, installation and ordering instructions.

INDUSTRIAL CLOTHING The B. F. Goodrich Co., Akron, Ohio, has issued a catalog section on a recently intro-

LUFKIN

UNIVERSAL SURFACE GAGE

Mechanics agree that the Lufkin Universal Surface gage is the finest tool of its kind money can buy. The hardened, well-proportioned base has four gage pins for guides on linear work. All measuring faces ground and polished. Spindle is constructed of hollow rigid steel tubing. The Universal Gage can be set upright, at any angle, or so that scriber can be used below the base. Both spindle and scriber are kept constantly in alignment by set screws.

See this gage at your dealers and write for free catalog.

BUY THROUGH YOUR DISTRIBUTOR . .

ARMY E NAVY

LUFKIN

SAGINAW, MICHIGAN · NEW YORK CITY

TAPES · RULES · PRECISION TOOLS

NOW NATIONALLY DISTRIBUTED THROUGH LEADING SUPPLY HOUSES

QUICK-ACTION VISE

This is the vise that has stepped up production of war work in thousands of plants. Combines quick action with powerful gripping pressure; precision adjusted for uniform, accurate holding; unexcelled for any small-parts production work.

For MILLING, DRILLING, TAPPING, and ASSEMBLING Operations in these Industries:

Airplane Engines
Automotive Engines
Guns and Small Arms
Precision Instruments
Tool Making
Electrical Equipment
Any Small Parts Production

3 SIZES: 4" • 5" • 7"

A partial list of suppliers who are prepared to give you service. If your territory is not listed, write us direct.

Dillon Supply Company
Raleigh, North Carolina

The Globe Machinery & Supply Co.
Des Moines, Iowa

The Hardware & Supply Company
475 - 535 South High Street
Akron, Ohio

The Jennison Hardware Company
Bay City, Michigan

Kasper & Koetzle, Inc.
563 - 565 - 567 Bushwick Avenue
Brooklyn 6, New York

Langdon Supply Company
1317 - 19 Union Avenue
Kansas City 7, Missouri

Lewis Supply Company
Main at Butler Street
Memphis, Tennessee

The C. S. Mersick & Company
P. O. Box 1690
New Haven 7, Connecticut

Mill & Factory Supply Co.
Toledo, Ohio

C. T. Patterson Company, Inc.
P. O. Box 640
New Orleans 7, Louisiana

Peden Iron & Steel Company
P. O. Box 1891
Houston 1, Texas

Henry A. Petter Supply Company
Paducah, Kentucky

Root, Neal & Company
P. O. Box 17 Station D — Zone 10
Buffalo, New York

The South Bend Supply Company
South Bend 24, Indiana

Strong, Carlisle & Hammond Co.
1392 West 3rd St.
Cleveland 13, Ohio

Theo C. Ulmer, Inc.
S. W. Corner Richmond St. &
East Columbia Ave.
Philadelphia 25, Pennsylvania

The Vonnegut Hardware Company
420 W. Maryland Street
Indianapolis 9, Indiana

CANADA
Northwest Industries Limited
10626 - 101st Street
Edmonton, Alberta, Canada

THE FENN MANUFACTURING CO.
HARTFORD, CONNECTICUT

duced line of industrial clothing coated with rubber or rubber-like materials. Price lists on this line also are available.

INDUSTRIAL LUBRICATION The Alemite Div., Stewart-Warner Corp., 1826 Diversey Pkway., Chicago, Ill., has issued folders on their four new lubricating systems—the LubroMeter, the Progressive System, the Dual Manifold System and the Dual Progressive System. Also a folder showing illustrations of the systems installed and working, all keyed for identification.

KNURLS Standard knurls, ground and lapped, thread rolls and micrometers made by the Reed Small Tool Works, Worcester, Mass., are presented in Catalog No. 62. In addition to giving complete instructions for ordering, the catalog also includes prices and a section giving hints on the use of knurls.

MILLING CUTTERS The complete line of carbide tipped plain and side milling cutters manufactured by Super Tool Co., Detroit, Mich., is presented in a folder giving complete details, specifications and prices.

MOUNTED GRINDING WHEELS A new folder on Stermount wheels and points, complete with sizes and prices, has been published by The Sterling Grinding Wheel Div., The Cleveland Quarries Co., Tiffin, Ohio.

OVENS The complete line of electrically-heated ovens manufactured by Harold E. Trent Co., Philadelphia, Pa., are presented in Bulletin 71-T announced by that company.

PRICE LIST The Air Reduction Sales Co., 60 East 42 St., New York 17, N. Y., has announced publication of a 20-page revised price list, "Gas and Electric Welding Supplies and Accessories," superseding previous lists. In addition, the contents include detailed data on sizes, dimensions, weights, stock members, forwarding information and recommended uses for products.

PRODUCTION LATHE The "Minneapolis" production lathe, which is adaptable to varied production setups, is presented in a new folder prepared by the Central Machine Works Co., Minneapolis 13, Minn.

SYNTHETIC RUBBER A 70-page book on synthetic rubber may be secured from the Acadia Synthetic Products Div. of Western Felt Works, 4115 Ogden Ave., Chicago, Ill. It contains 16 pages of photos, 20 pages of comparative tables plus many charted tests of such effects as freeze resistance, hardness, heat and other conditions, installation drawings, and data on extrusions, sheets, rolls and cut parts.

TENSILE TESTER Bulletin No. 144 announced by W. C. Dillon & Co., Inc.,

5410 West Harrison St., Chicago 44, Ill., features their Model K small-size portable tensile tester and also includes photos and descriptions of various accessories for all types of testing. Sizes and prices are listed.

TOOL STEEL Jessop Steel Co., Washington, Pa., has issued two folders on their rapid-finishing tool steel and their purple label extra high speed steel. The folders include a typical analysis, applications and working data for each type.

TRANSFORMERS Plant owners, operators or consulting engineers will be interested in a booklet published by General Electric Co., Schenectady, N. Y., entitled "Summary of Safety and Savings with All-Purpose Pyranol Transformers."

WRENCH Greene, Tweed & Co., Bronx Blvd. at 238 St., New York 66, N. Y., announce availability of Bulletin F-10 on their FAVORITE reversible ratchet wrench which has a double head to accommodate two sizes of nuts. This bulletin shows how the tool is designed and used, lists its applications and includes complete data on dimensions of the sizes which cover nuts for all standard square and hex bolts and studs up to 1¼ in.

X-RAY NORELCO Searchray 150, a complete, self-contained industrial X-ray unit for examining specimens for internal flaws, cracks or foreign matter, is illustrated and described in a four-page folder (S150) which tells how it works and lists its advantages and applications, offered by the North American Philips Co., Inc., 100 East 42 St., New York 17, N. Y.

NEW BOOKS

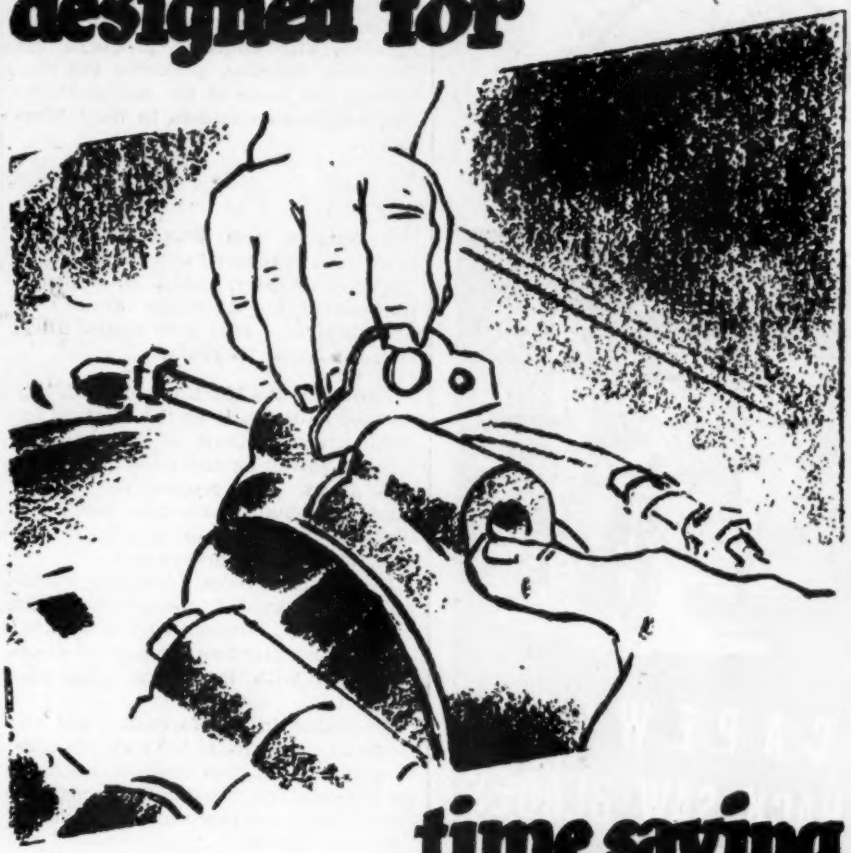
BLUEPRINT READING—*By Fred Nicholson, mechanical instructor, Henry Ford Trade School, and Fred Jones, head of drawing department, Ford Motor Co. Trade School.* 141 *pages. Published by D. Van Nostrand Company,* 250 *Fourth Ave., New York, N. Y.* $2.

The ideal way to teach blueprint reading is to show the pupil the print, the tools, machines and measuring instruments needed to do the job and then show how dimensions are used. This being impractical, the present volume was developed as a near solution to the problem.

Fifty lessons are contained in the book, each accompanied by a plate illustrating a pertinent print. After completely describing the machines and methods required, a group of questions is given to provide a check on the pupil's new-found knowledge.

In the belief that mathematics is essential in blueprint reading, a review

designed for



time saving

Quick-precision shimming with Laminum often cuts assembly time 20 to 30%. Is introduced without fuss . . . also eases shop, maintenance and service routine.

Shims cut to your specifications. Stock shim materials obtainable from your dealer. Write us for further information and shim application chart.

Laminated Shim Company, Incorporated • 50 Union St., Glenbrook, Conn.

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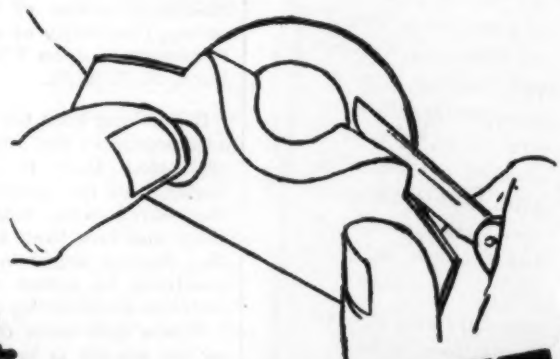


it's LAMINUM

TRADE MARK

THE SOLID SHIM THAT peels FOR ADJUSTMENT

CAPEWELL
HACK SAW BLADES
Set Record
Cutting
STAINLESS
STEEL
Pipe
THE JOB: Cutting STAINLESS STEEL pipe, No. 304 type, ranging 3" to 6" in diameter, with walls from 1/8" to 5/16" thick... running at 92 S. F. M. with .006 feed, in a very watery emulsion.
THE RECORD: 28 hours continuous service.
THE CAPEWELL MFG. CO.
Hartford, 2, Conn.
The trend is to Capewell's TECHNITE — the molybdenum high speed hack saw blade
CAPEWELL
HACK SAW BLADES

of shop mathematics is given for those who may be in need of a refresher course. The appendix, in which this appears, also contains problems for sketching practice, problems for cla models and some of the abbreviation and standards common to most blueprints.

•

CONSERVATION AND SALVAGE OF TOOLS AND GAGES—*Prepared and published by Hartford Chapter, A. S. T. E.* 68 pages. *Distributed by American Society of Tool Engineers, 2567 West Grand Blvd., Detroit, Mich.* 75 *cents.*

Known as the Hartford Manual, this booklet is designed as the nucleus for further compilations of data on designing, salvaging and reclaiming tools and gages. The project was undertaken to debunk many false ideas and illusions and try to direct orderly thought on shop practices.

Design is covered from the standpoint of material conservation and broad utility; salvage covers brazing, plating and grinding, and other chapters deal with increasing gage and tool life.

As stated in the foreword, the authors do not claim to have all information on the subjects covered, but they do give enough to stimulate constructive thought on problems that will always be with us.

Above all, the book asks, keep an open mind for new ideas and adapt them to current needs. In trying to forecast future trends, the book concludes with a list of many expected changes which will have a decided bearing on tool engineering.

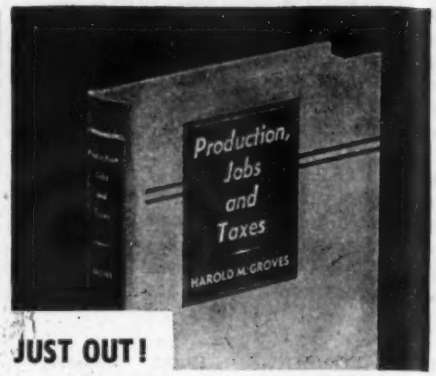
•

WORK METHODS MANUAL—*By Ralph M. Barnes, professor of industrial engineering, University of Iowa.* 136 *pages. Published by John Wiley & Sons, New York, N. Y.* $1.75.

It has long been the custom to teach newcomers to the newspaper writing profession that if they have the answers to the questions implied by the words who, what, why, where, when and how their story is complete. Mr. Barnes suggests that the same questions be asked when making a methods engineering study of any job.

Where this book differs from most on the subject is in its approach, and in the fact that it is written for the foreman and worker, rather than the methods engineer. This is done with the realization that in the final analysis it is the worker that makes any new method work. Thus, if he knows why things are done the way they are he may be more amenable to any changes.

To show how methods engineering has been successfully applied to many types of operations, case studies are given covering subjects ranging from signing letters to assembling meters.



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This book presents the results of the first of the numerous research studies being made by the Committee for Economic Development, to provide factual information for its membership in their battle against mass unemployment.

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Postwar Revision of the Federal Tax System to Help Achieve Higher Production and More Jobs.

By HAROLD M. GROVES
Professor of Economics, University of Wisconsin
115 pages, 5¾ x 8¾, $1.25

Can a moderate and equitable federal tax program be made an instrument for the encouragement of business enterprise and job opportunities? Here, in this single concise volume, is the starting point of analysis and recommendation for all concerned with this important problem.

The book discusses many aspects of corporation and personal taxes, with attention to both sides of controversial questions, and a boiled-down analysis of plans, old, current, and new that will be invaluable to every reader who wishes a quick view of pivotal points and trends in this important field.

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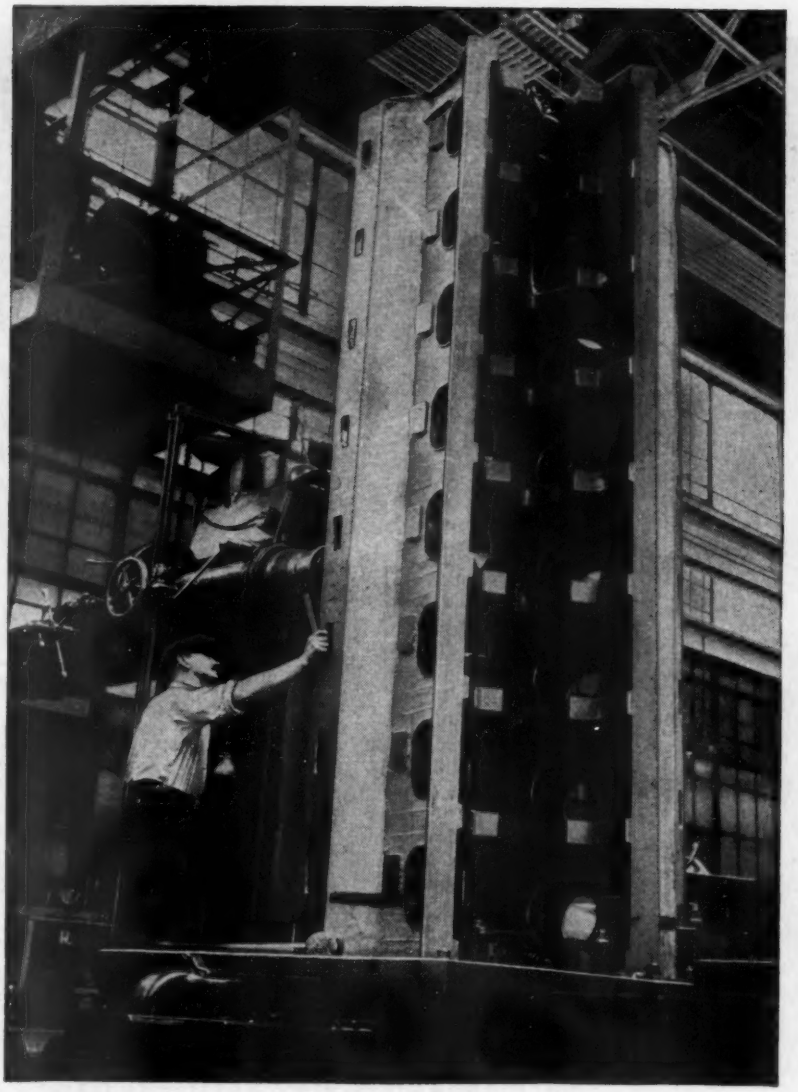

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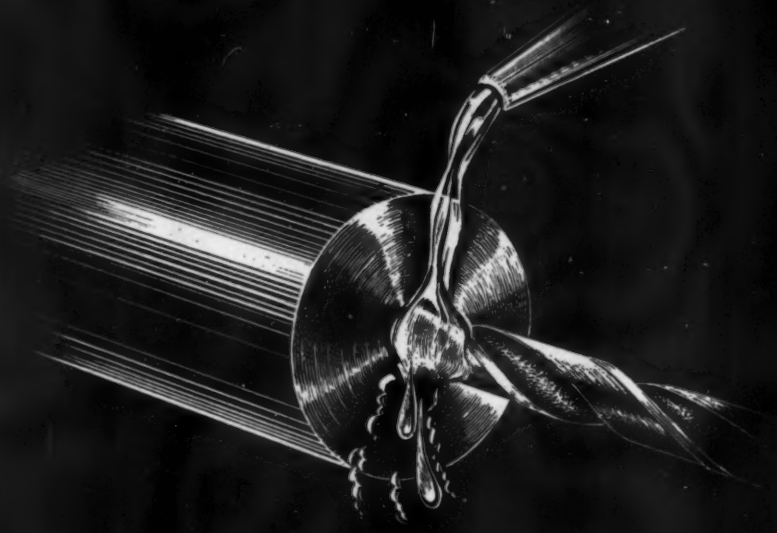

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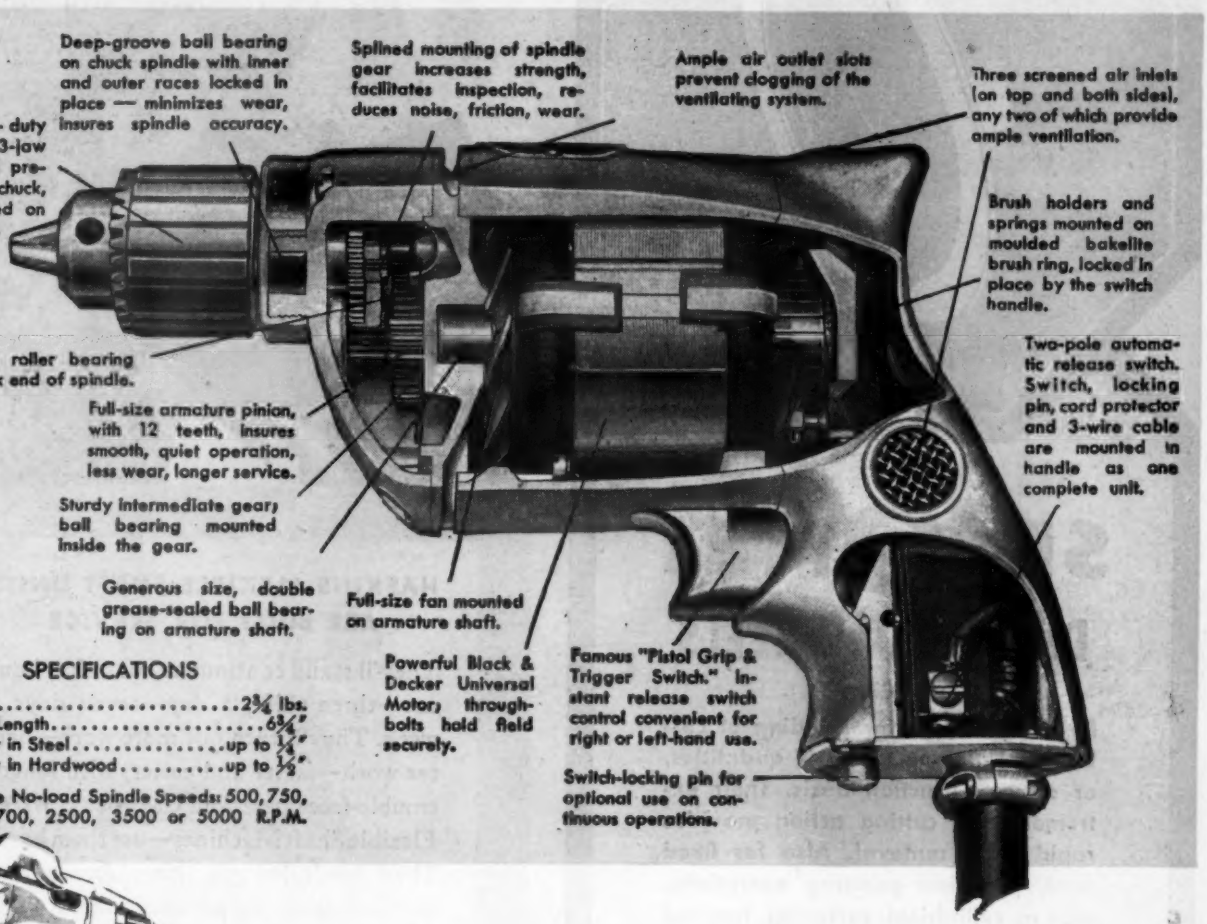
Deep-groove ball bearing on chuck spindle with inner and outer races locked in place — minimizes wear, insures spindle accuracy.
Splined mounting of spindle gear increases strength, facilitates inspection, reduces noise, friction, wear.
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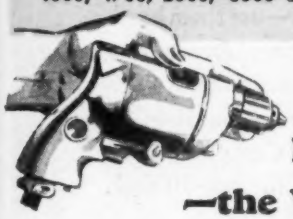
Available No-load Spindle Speeds: 500, 750, 1000, 1700, 2500, 3500 or 5000 R.P.M.



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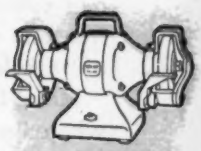
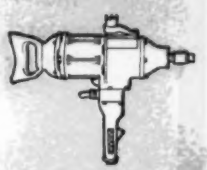

BENCH GRINDERS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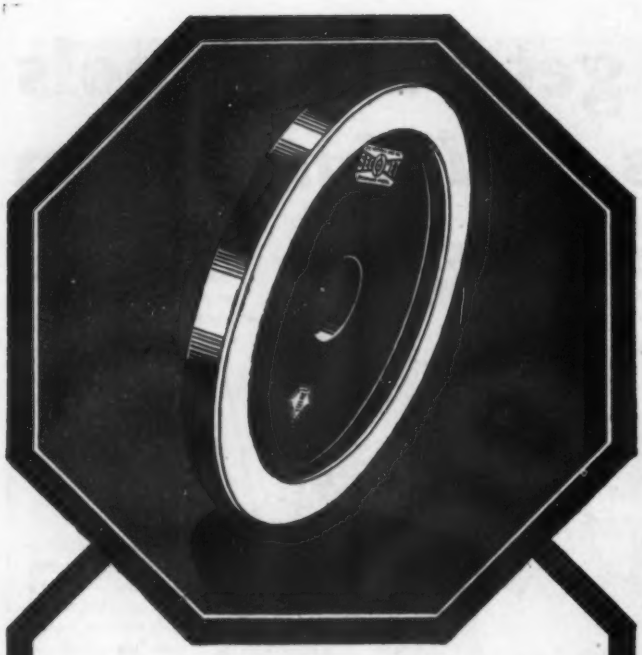

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Resinoid-bonded **for grinding of carbide-tipped tools in large quantities, or on a production basis. Their extremely fast cutting action provides rapid stock removal. Also for fixed feed, precision grinding operations, such as cylindrical, surfacing, internal and cutter grinding, because of their free and cool cutting action and ability to hold size.**

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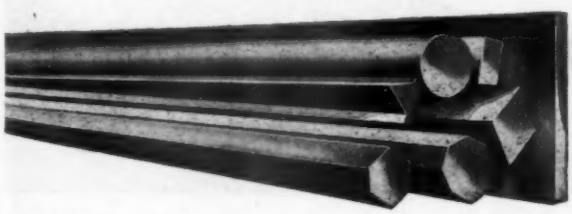

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It's the HANDIEST tool you can have for All HIGH-SPEED SAWING!
SKILSAW Speeds Metal Cutting in Production Work
• Cuts stainless steel faster . . . cuts copper sheets up to 5/8 in. thick . . . lead sheets up to 2 in. thick . . . saws channel steel up to 16 gauge and many types of corrugated metals.
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On production work, SKILSAW Model "77" quickly cuts wood, sheet metal, plastics and compositions. In maintenance, it's the fastest, handiest tool for ripping up old floors, cutting lumber for bins and platforms . . . for cutting grooves for shelves. And in shipping or receiving rooms, SKILSAW Model "77" makes fast work of crating or uncrating without damage to contents.
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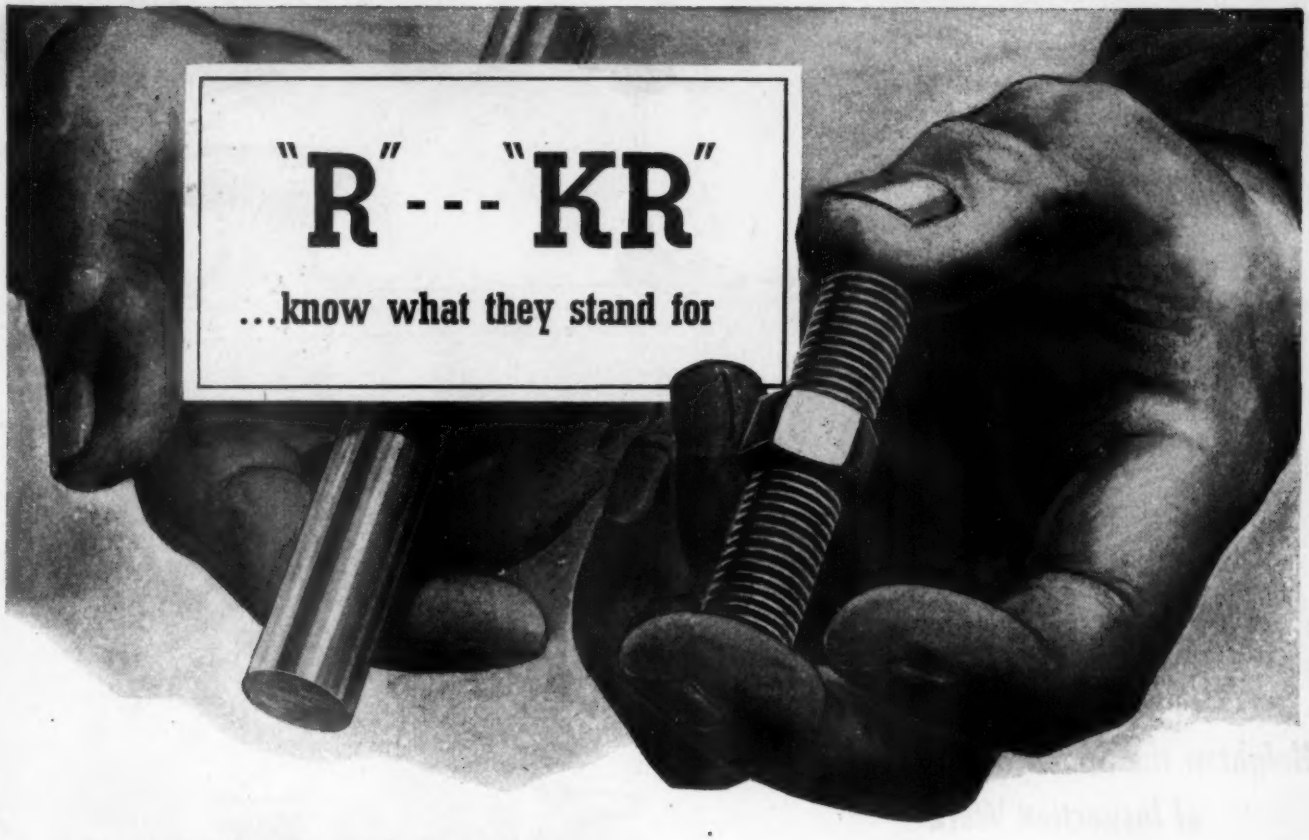

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The strength and corrosion resistance of Monel are so well known that they require no comment.

But do you realize that in addition to *regular* Monel, there are two *special* Monels—"R" Monel and "KR" Monel?

"R" Monel . . . When introduced several years ago, "R" Monel made available the properties of Monel coupled with improved machinability.

"R" Monel is readily fabricated by cold forming—is produced as hot-rolled and cold-drawn rounds, squares and hexagons. It is ideally suited for the automatic production of rust-proof screw machine parts, yet has mechanical properties equal to steel screw stock (S.A.E. 1112), and is actually tougher.

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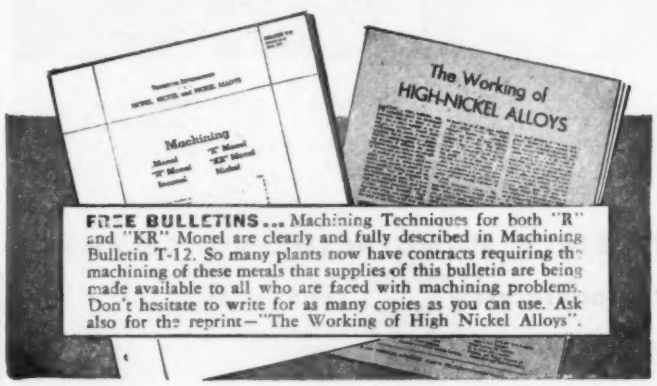
"KR" should be used for screw machine products which are to be heat treated after machining. Remember "KR" Monel as the MACHINABLE brother of "K" Monel, long known for its great strength and hardness. The International Nickel Company, Inc., 67 Wall Street, New York, N. Y.

★ ***SAVE MACHINING TIME AND MONEY . . . Specify "R" Monel and "KR" Monel***



FREE BULLETINS . . . Machining Techniques for both "R" and "KR" Monel are clearly and fully described in Machining Bulletin T-12. So many plants now have contracts requiring the machining of these metals that supplies of this bulletin are being made available to all who are faced with machining problems. Don't hesitate to write for as many copies as you can use. Ask also for the reprint—"The Working of High Nickel Alloys".

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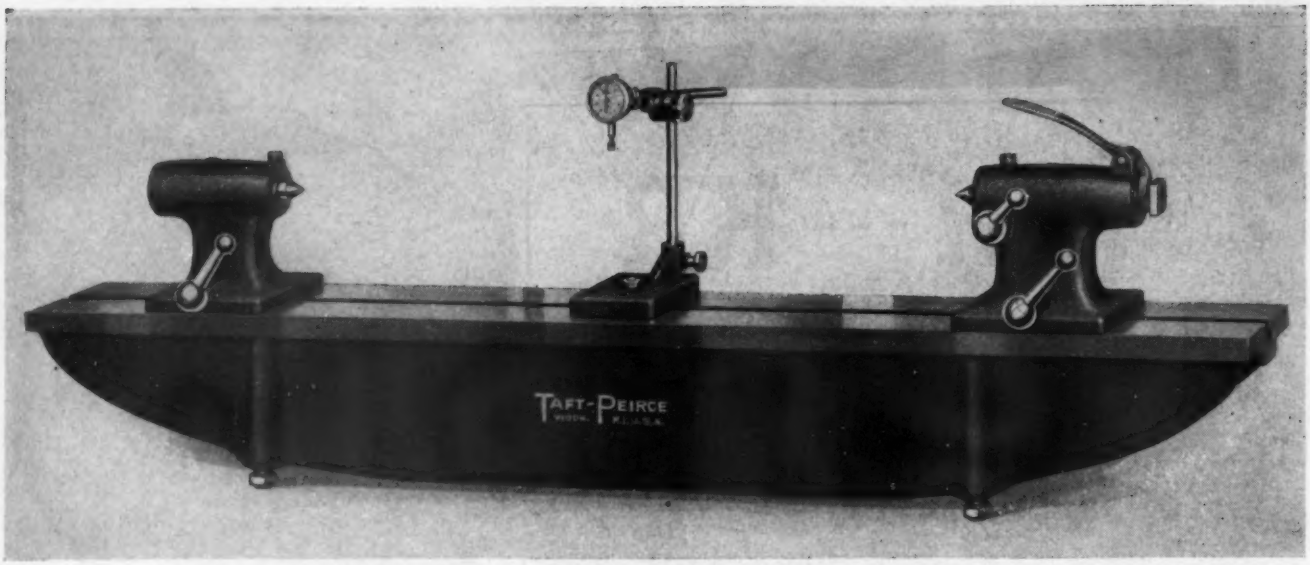

Taft-Peirce Style 9205 Bench Center with dial indicator. Indicator bracket base, 3¼" x 4½". Height of post, 8½".

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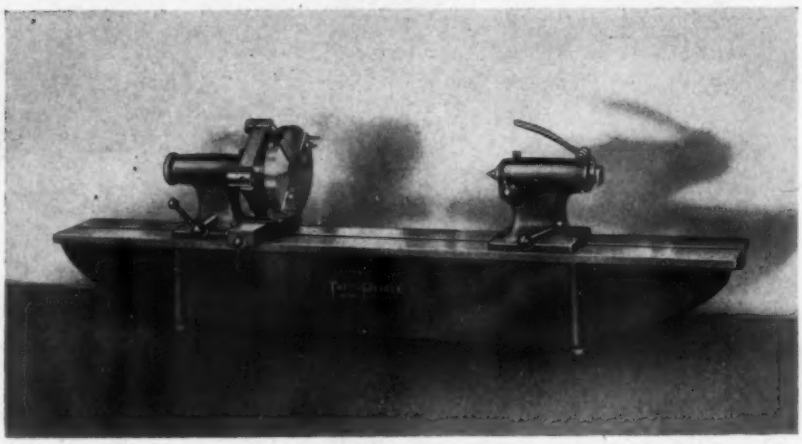
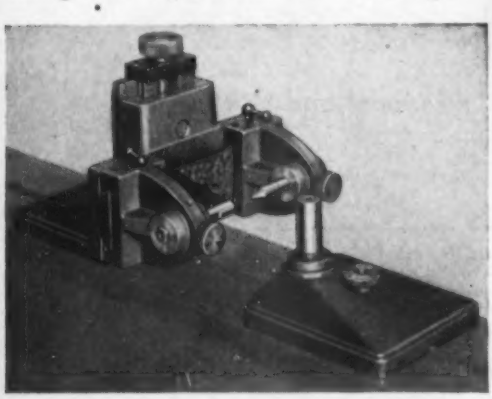
Heighten the Speed and Accuracy of Inspection Work

Centering or removal of the work is facilitated by a spring-actuated sliding sleeve in the tailstock center. This spring center may be locked in position, when indicating heavy work, by a convenient clamping lever.

Head and tailstocks are aligned by keys which fit a ½-inch T-slot in the bed. This makes it readily possible to lock the head and tailstocks at any point on the bed and to mount a standard dividing head. Other uses and fixtures for Taft-Peirce Bench Centers are shown at the right and below. These precision inspection tools are made in 18" or 36" lengths between centers, with a tandard swing of 8". Quotations for the asking.

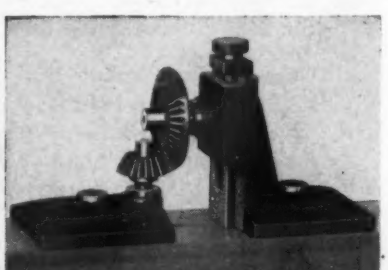


Taft-Peirce Style 9205 SB Bench Center with Sine Bar Indexing Head with Face Plate, for accurate indexing and dividing.



Worm Gear Head and Plain Head on Taft-Peirce Style 9205 GR Bench Center.

Spur Gear Plain Heads on Taft-Peirce Style 9205 GR Bench Center.



Bevel Gear Checking Head and Plain Head on Taft-Peirce Style 9205 GR Bench Center.

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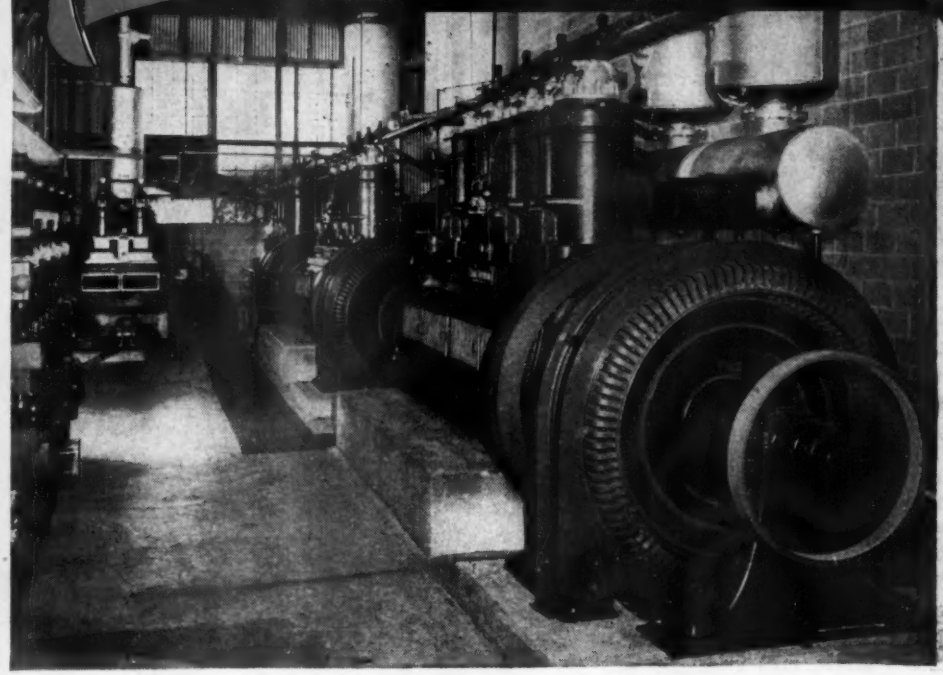
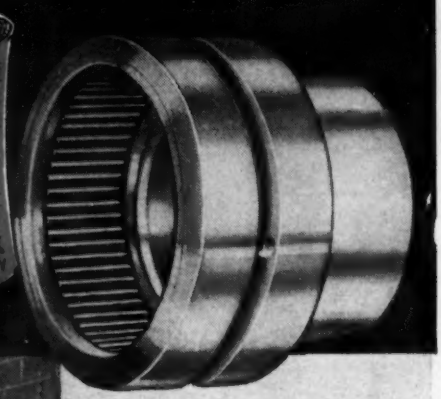
ORANGE ROLLER BUSHINGS

—withstand severe shock loads in the Piston Pins of these VENN-SEVERIN DIESEL ENGINES





24 HOURS A DAY 6 DAYS A WEEK

this 1150 H. P. Diesel plant carries continuous loads of 700 K. W. All piston pins run on Orange Roller Bushings, which are subjected to heat and repeated shock loads caused by combustion. Venn-Severin Machine Company has used Orange Roller Bushings for a number of years and reports "most satisfactory results" despite this severe service.

There are few busier or more punishing spots for a needle bearing, than in the piston pins of a powerful diesel engine. The fine record achieved in Venn-Severin diesel plants is another example of the ability of Orange Roller Bushings to "take it" under severe running conditions.

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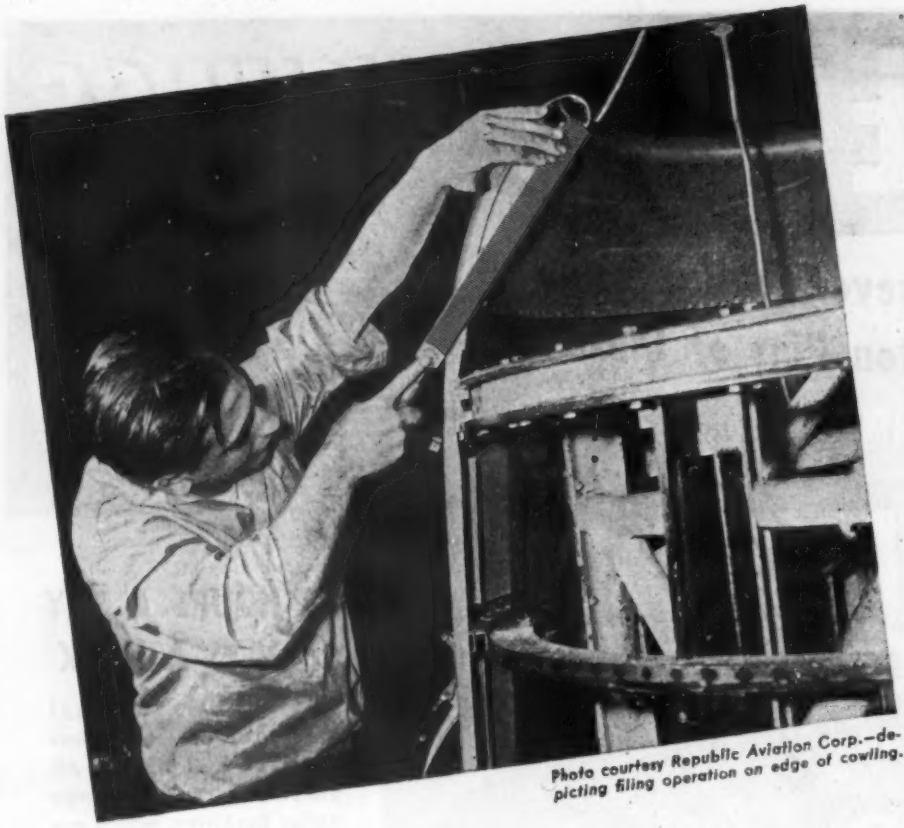

Photo courtesy Republic Aviation Corp.—depicting filing operation on edge of cowling.

SAYS a spokesman for the builders of the famous *Thunderbolt* fighter: "Our plant uses Nicholson Files extensively and in wide variety — as is natural where many types of materials are used, and die-making, fabricating, assembling and tool maintenance demand many kinds of filing operations."

When it comes to providing *The right file for the job*, there is no better source than Nicholson. In addition to manufacturing the hundreds of established kinds, cuts and sizes of files, Nicholson is constantly studying new developments — in metals, alloys, shop practices, production methods — in which new types of files may prove helpful.

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whose postwar plans call for long runs of a given part

You will want your after-war parts sources to have:

The ability and skill to work to close tolerances.

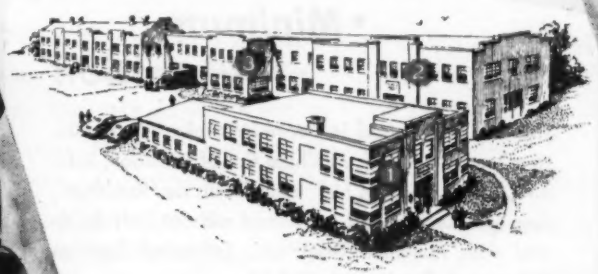
An efficient setup for uniform production of long runs.

Capacity and reliability to insure prompt deliveries.

Experience in adapting new skills and new materials to your parts needs.

Whether your production plans call for forgings, castings or plastics, we believe that Brake Shoe plants plus Brake Shoe Research can be of practical assistance.

If this interests you, write R. B. Parker, American Brake Shoe Company, 230 Park Avenue, New York 17, New York.



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A parts source that may help you meet postwar competition

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SPEED CASE STEEL

A LOW CARBON OPEN HEARTH PRODUCT

IMPROVED QUALITY

- High Physical Properties
- Excellent Carburizing Qualities
- No Soft Spots
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If you wrote your own specifications for the ideal, all purpose, open hearth carburizing STEEL, it would be . . .

SPEED CASE!

• Minimum Distortion

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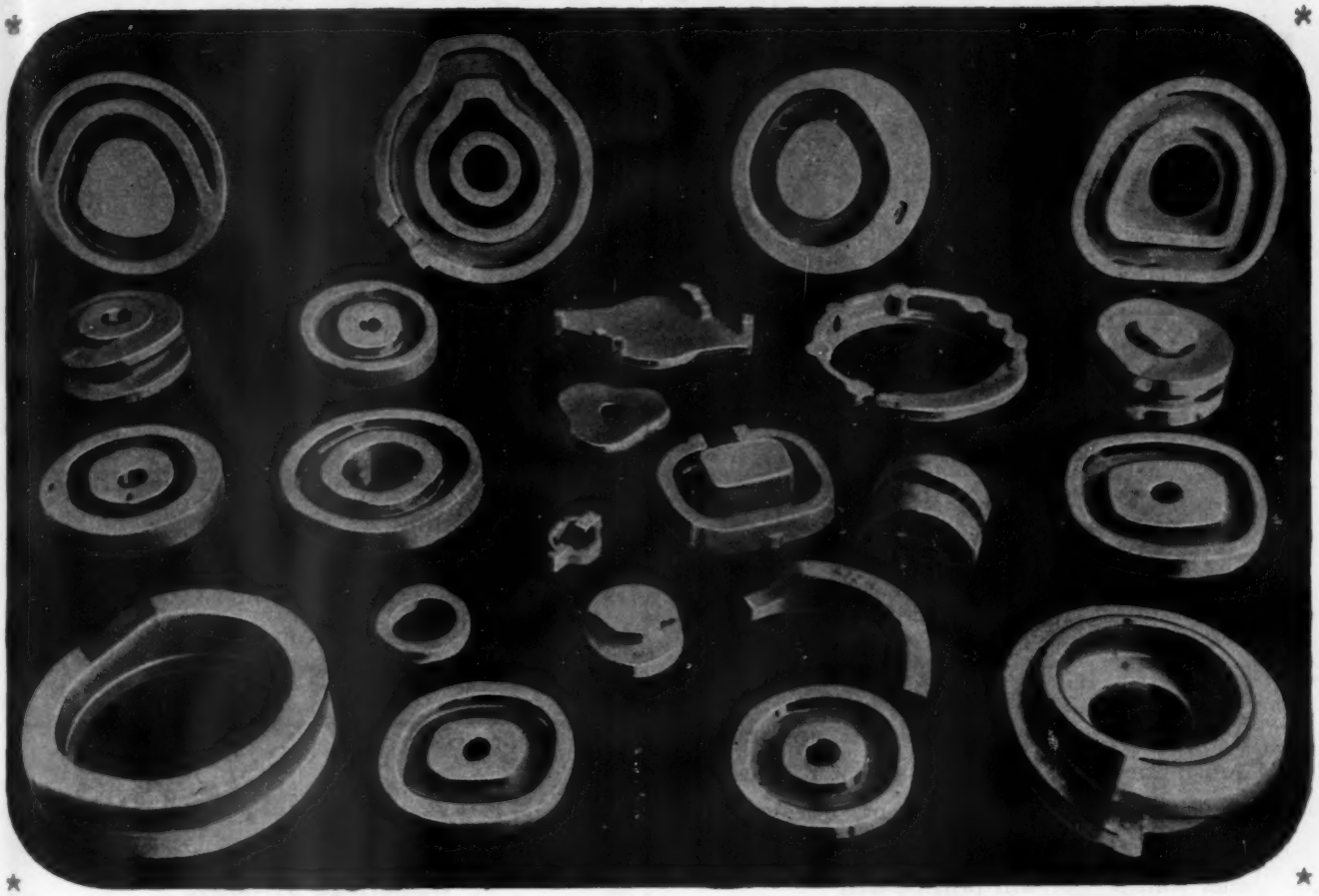

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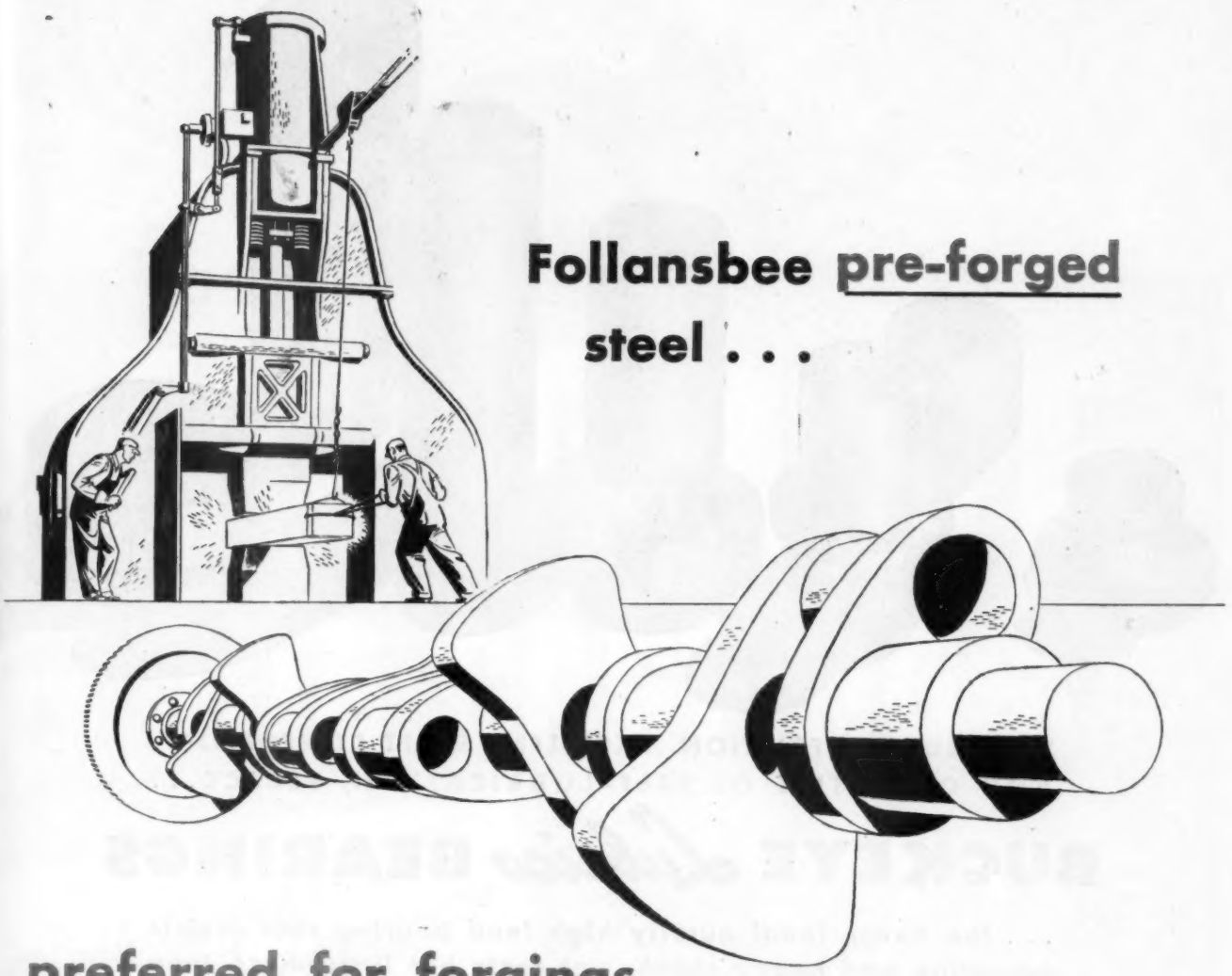

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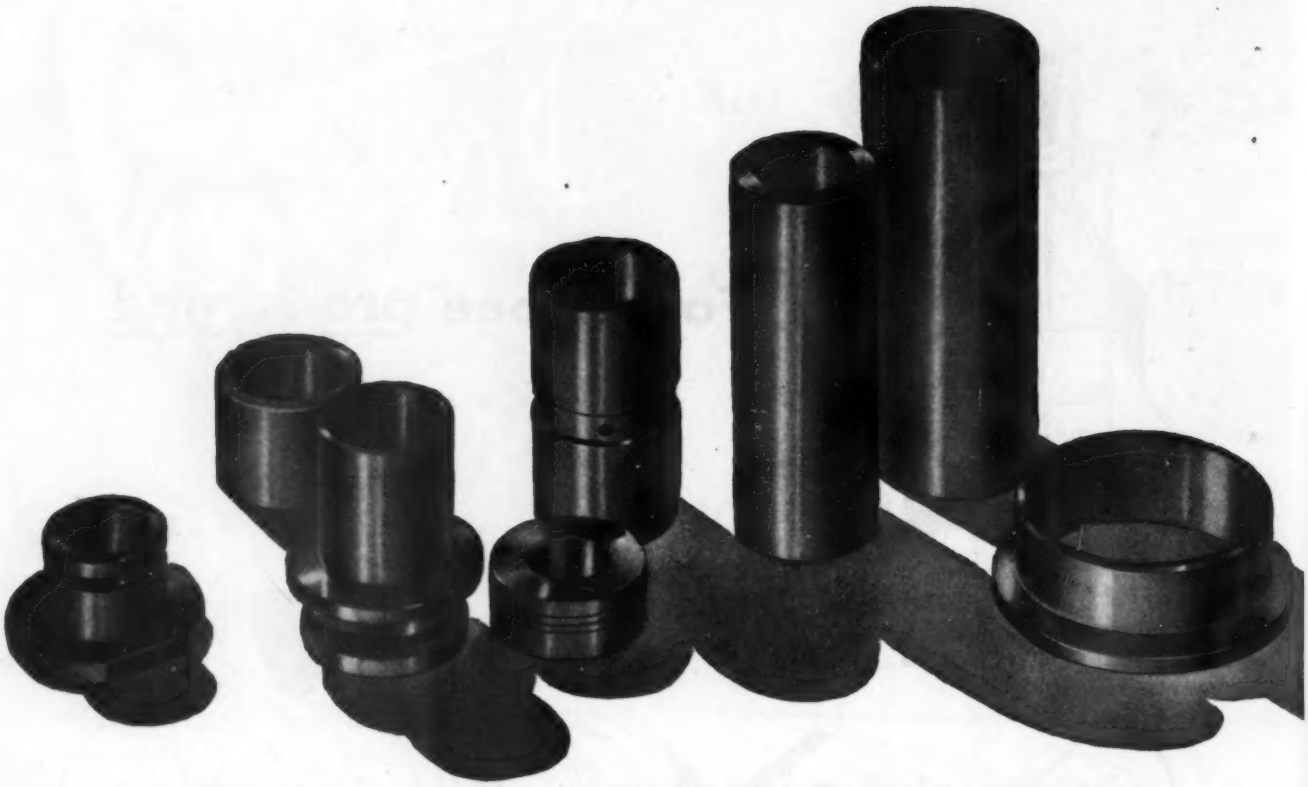

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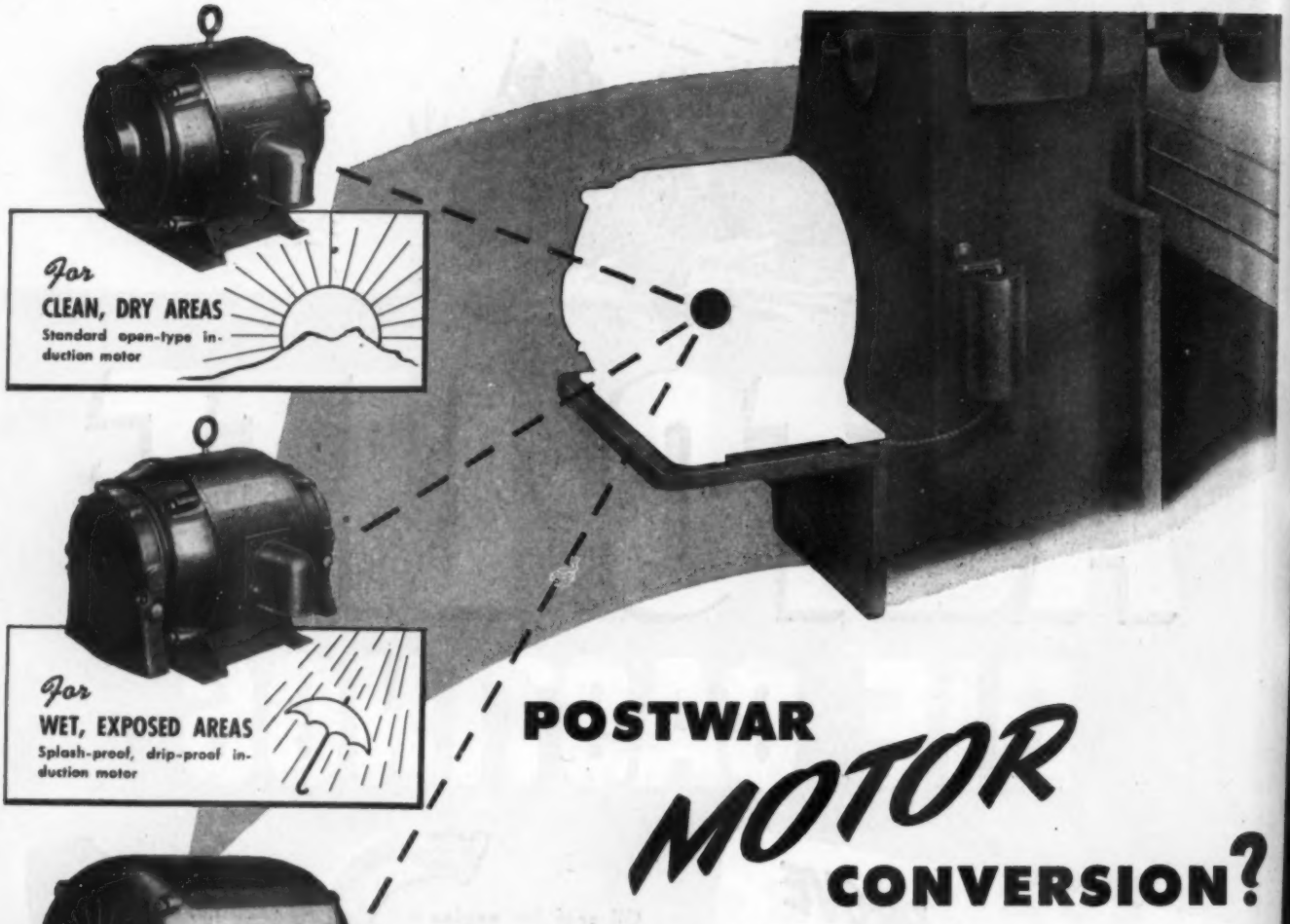

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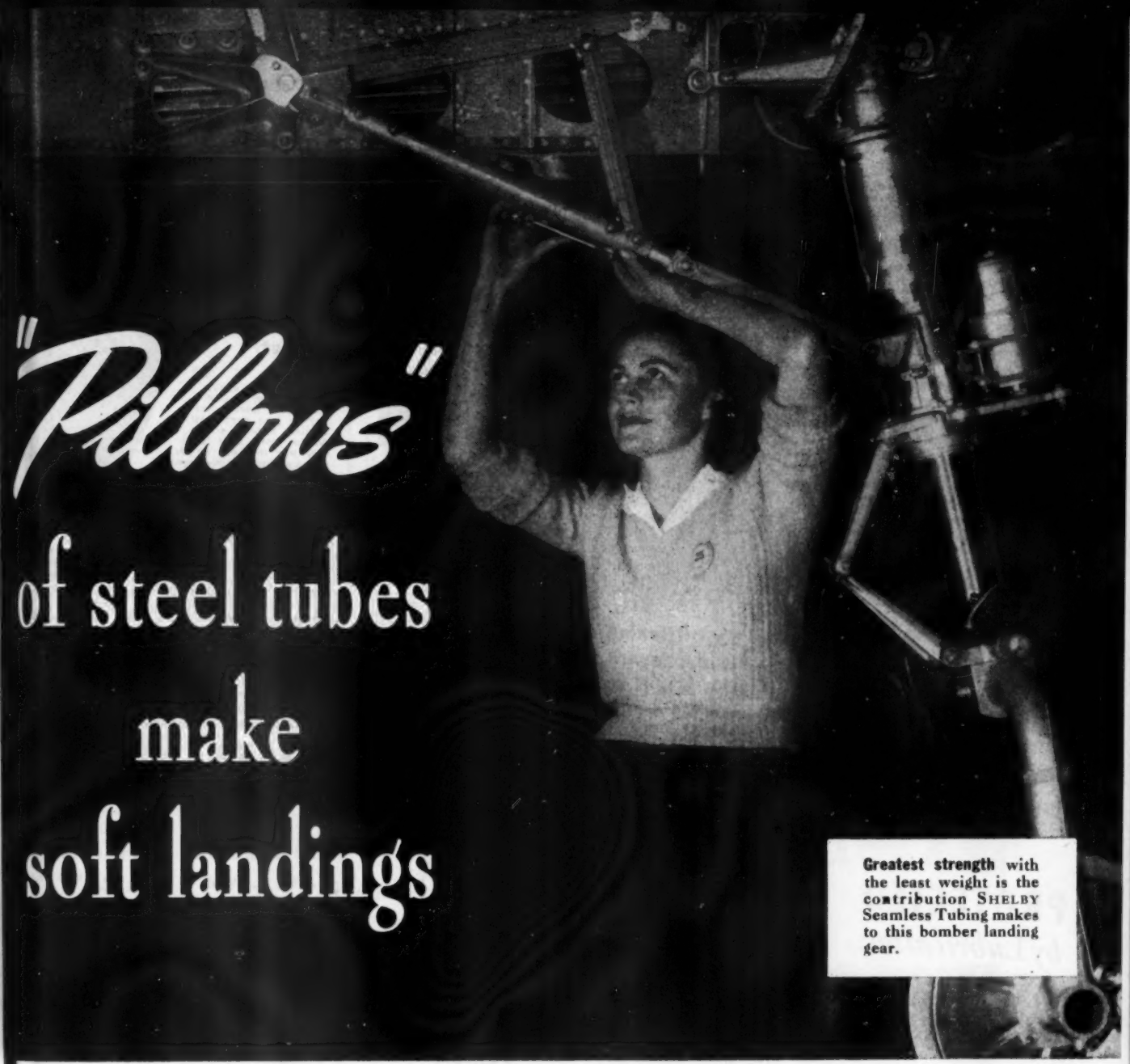

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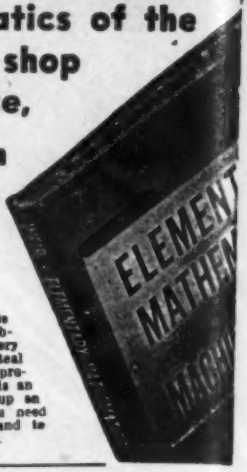

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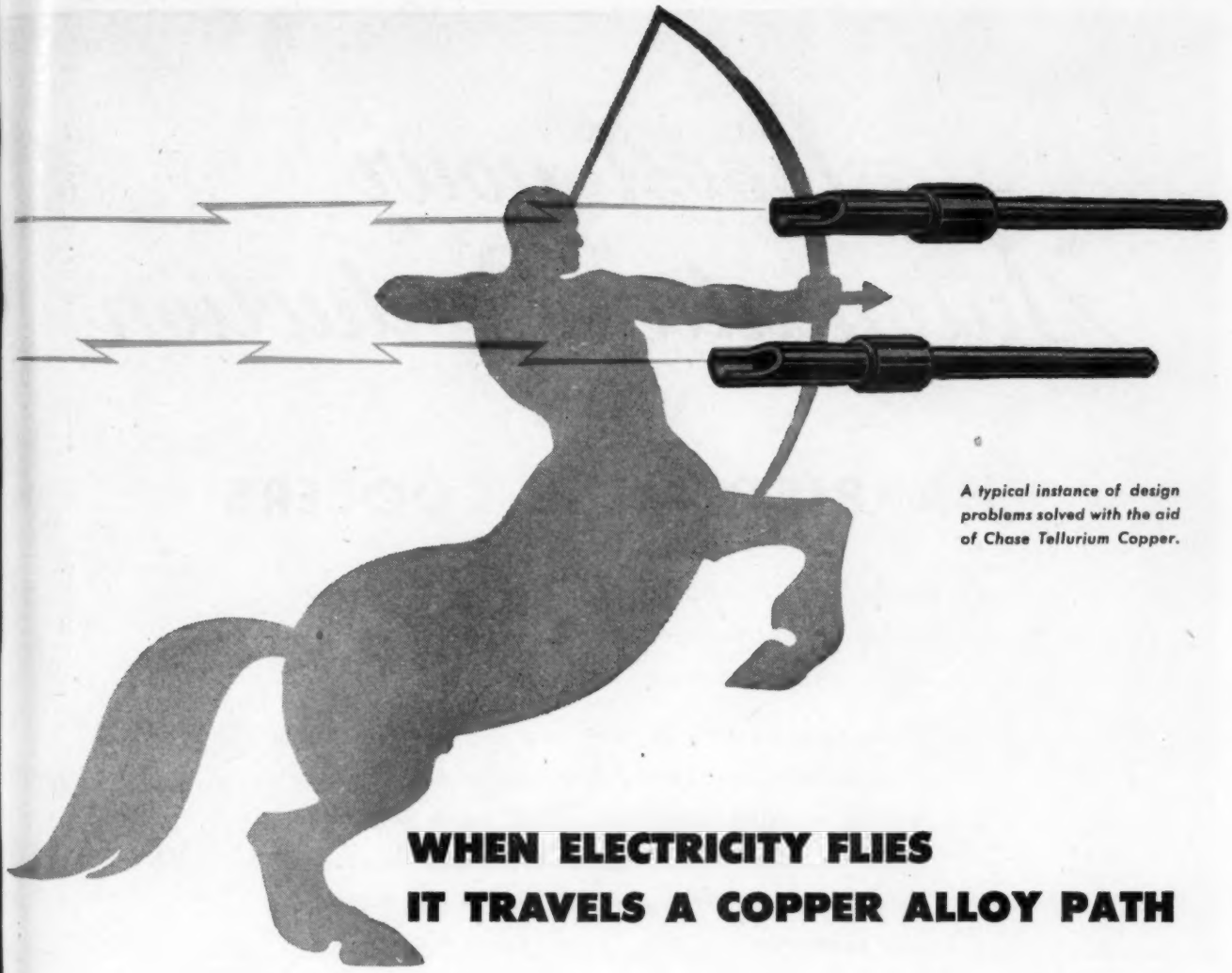

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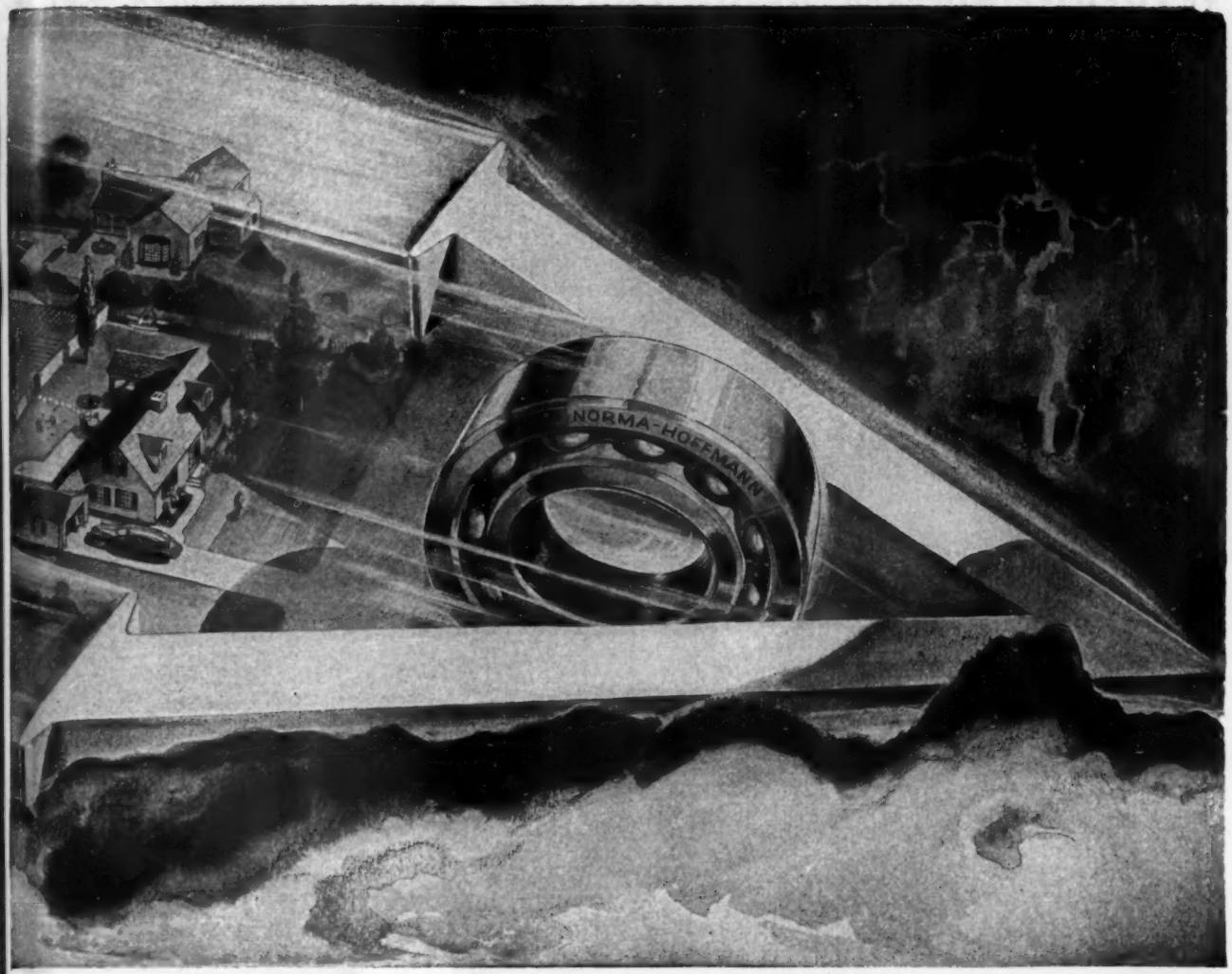

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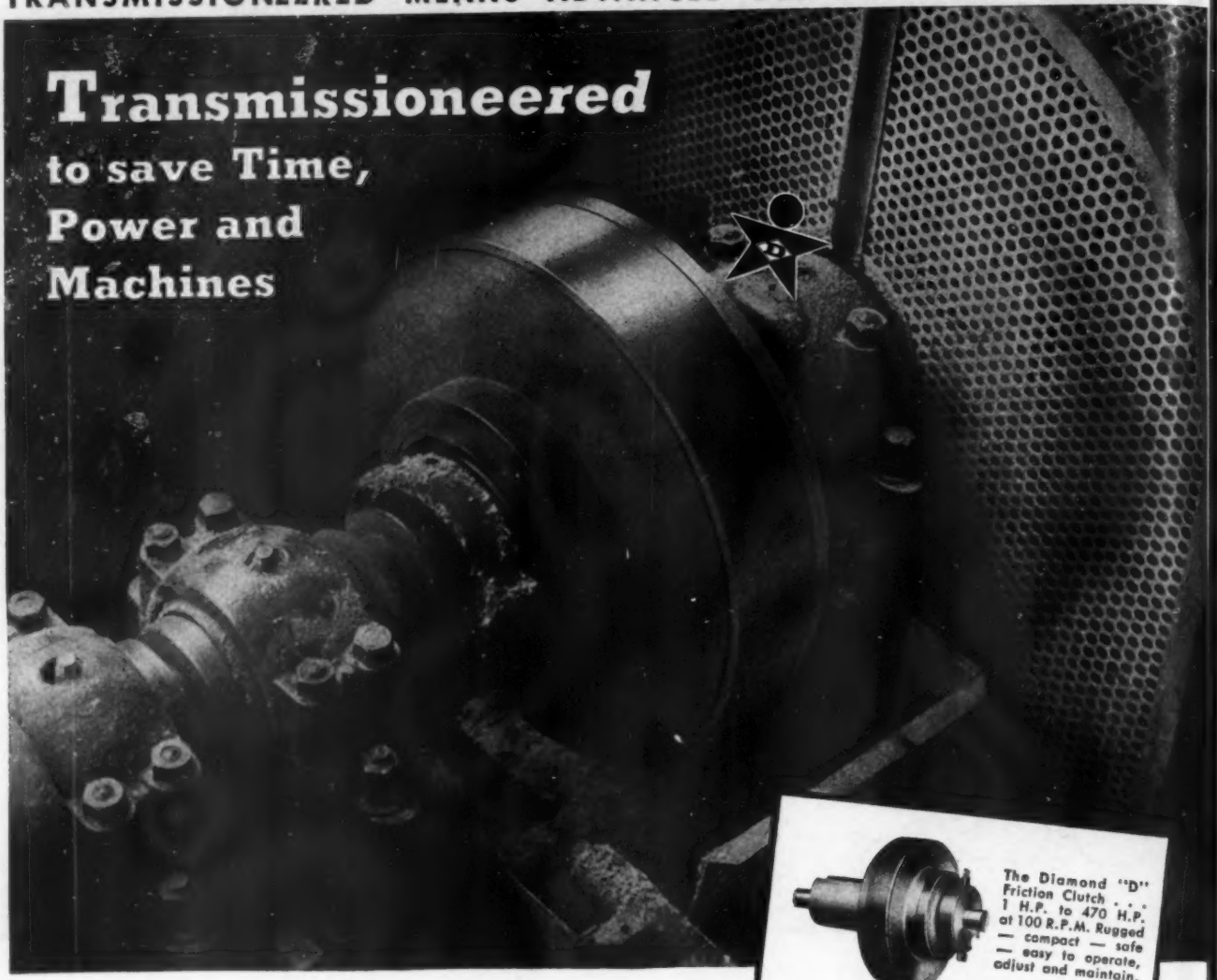

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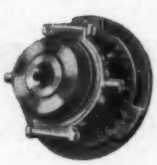

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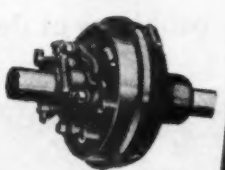

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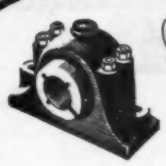

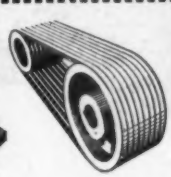

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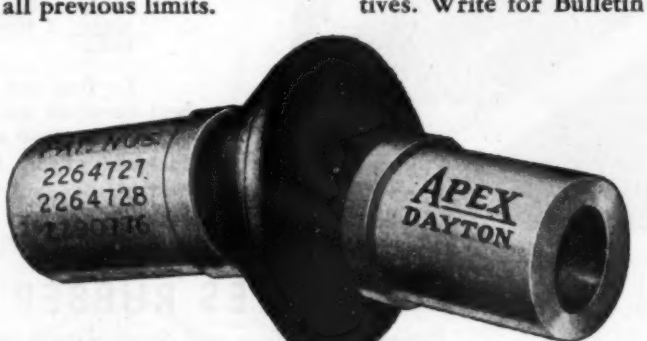


APEX

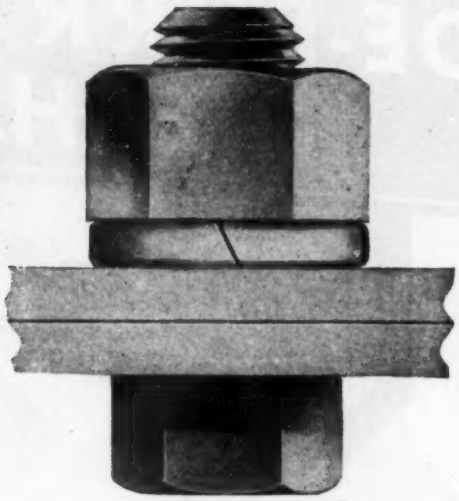
Aircraft Universal Joints

Exclusive Licensees Under F. & S. Patents

THE APEX MACHINE AND TOOL COMPANY • DAYTON 2, OHIO

When we say "spring"...

WE MEAN



Tight—a nut wrenched home sets up great pressure on threads and between all parts.

No other device has the power and the long range of live spring action given you by a Kantlink Spring Washer.

There is no substitute as economical. The short-range multi-toothed washers that bite in can not possibly equal Kantlink's range of spring power.

And the only claim for a fixed nut is that it can't turn on a bolt. Nuts rarely ever turn backward on bolts—they can't turn while there is any pressure at all on the threads of the nut and its bolt. But the **other** parts of almost every vibrating bolted construction wear loose inevitably, **unless** held fast by a strong compensating spring.

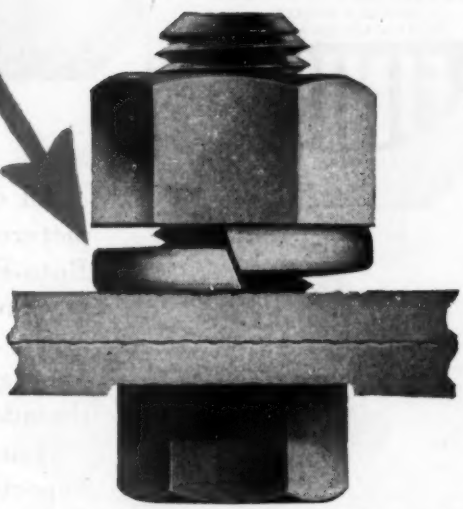
The parts wear loose because of bolt stretch and frictional wear of metal on metal, burrs and flares, and because of pulverizing of paint, scale and rust.

Kantlinks are being used with millions of nuts, bolts and screws of all types. They keep expanding to hold all parts **tight** despite inevitable wear.

In ordering spring washers—specify **Kantlink,** the big long range live spring washer.

Let us send you samples,—send details of your application. Test and compare them on the same job with **any** type of nut, or with any other type of washer. Kantlinks can't lose a real test. Try them for efficiency, economy and real safety.

Write today for descriptive folder.



Still tight. Though the nut never turned, the other parts wore and stretched. The assembly would have loosened except for the wide range of spring power of a—

KANTLINK TRADE MARK

the long-range Spring Washer

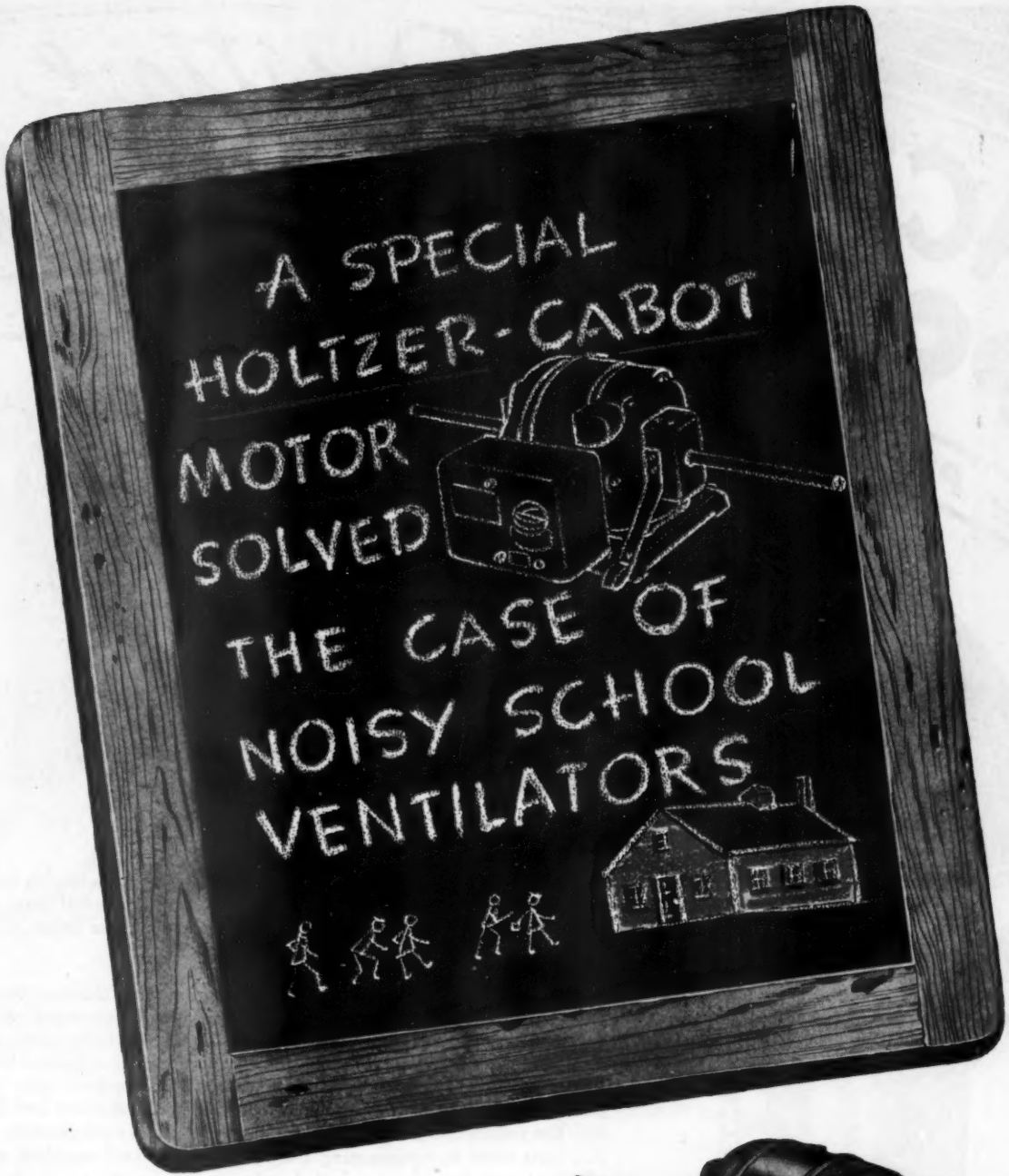
THE NATIONAL LOCK WASHER COMPANY
NEWARK, N. J., U. S. A.

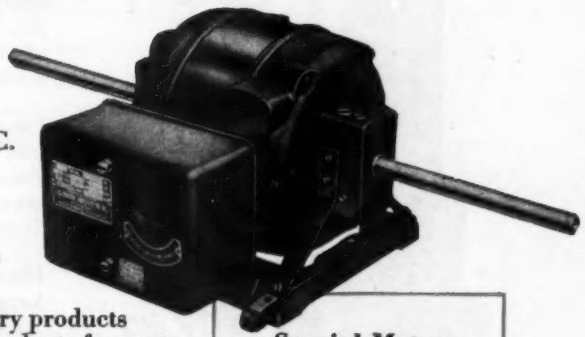
All of the great variety of small parts you see in this picture were de-burred successfully, in quantity, by the Roto-Finish process. This revolutionary new method of mechanical finishing is used with equal success on steel, brass, aluminum, stainless and nickel steel parts . . . on castings up to 75 pounds, as well as the tiny, delicate, threaded parts shown here.

Hundreds of plants are using Roto-Finish today to effect important savings in time and costs over hand methods of de-burring, grinding, honing, and buffing. Precision tolerances are maintained and far better finishes secured. Send for complete information and let us process samples of your parts—without charge.

THE STURGIS PRODUCTS CO.

207 JACOB STREET, STURGIS, MICH.





Not too long ago — school ventilators were powered with D. C. motors because everyone thought that an A. C. motor couldn't be built that would operate *quietly*.

Holtzer-Cabot motor development engineers dispelled this bug-a-boo by designing a special fractional H. P. motor that exactly met all the performance requirements including *extreme silent* operation.

Today, Holtzer-Cabot is building special motors for military products exclusively. However, if you're planning or working on products for post-war, our engineers—backed by over 50 years of experience in designing and building motors to fit specific applications such as instrument, aircraft, machine tools, business machines, etc.—would like to talk with you on your motor problems.

Special Motors Designed To Fit The Application

The HOLTZER-CABOT ELECTRIC COMPANY

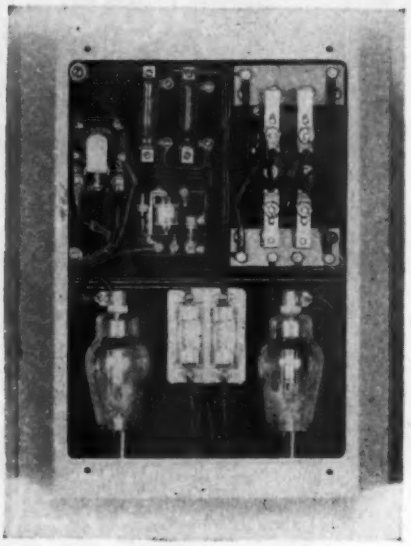
Designers and Builders of Special Fractional HP Motors and Electrical Apparatus

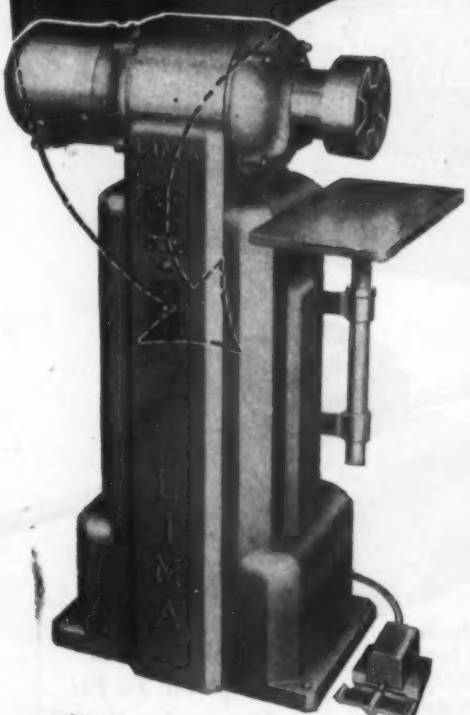
125 Amory Street, Boston 19, Mass.; Chicago, Illinois; New York, N. Y.; Philadelphia, Pa.

ACTION—Positive
POWER—Dependable

for POLISHING . . . BURRING OR LAPPING . . .

RELAY PANEL AND RECTIFIER BUILT INTO PEDESTAL BASE





The Lima Magnetic Polishing Lathe offers Positive Action, with Dependable Power for Polishing, Burring or Lapping ferrous metal parts or sections which cannot be held in a conventional chuck or collet, or where holding marks cannot be tolerated.

The four cycle operation of this lathe; Magnetizing, Starting, Stopping and Demagnetizing is obtained through the LIMA developed relay circuit and "step-release" foot pedal control. The dependable power supply of DC current for operation of the magnetic chuck is obtained from the LIMA built, full wave type rectifier unit. This compact relay control panel and rectifier unit is shown in the above illustration and is built into the pedestal of the Lathe, making it a completely self-contained unit. All parts used in constructing the relay system and rectifier unit are standard, and have been selected only after exhaustive tests, to insure the best possible performance and long life.

Lima Magnetic Polishing Lathes will hold pieces or parts from 7/8" diameter up. Interchangeable face plates and register plugs make it extremely flexible in that many different sizes and shapes of work can be handled on one size chuck, simply by changing the face plate and register plug. It requires only a few moments of time to make this change.

Many features which speed up handling time in Polishing, Burring or Lapping operations are built into the Lima Magnetic Polishing Lathe. An engineering bulletin describing the operation and application of this lathe is available. Wire or write today for your copy.

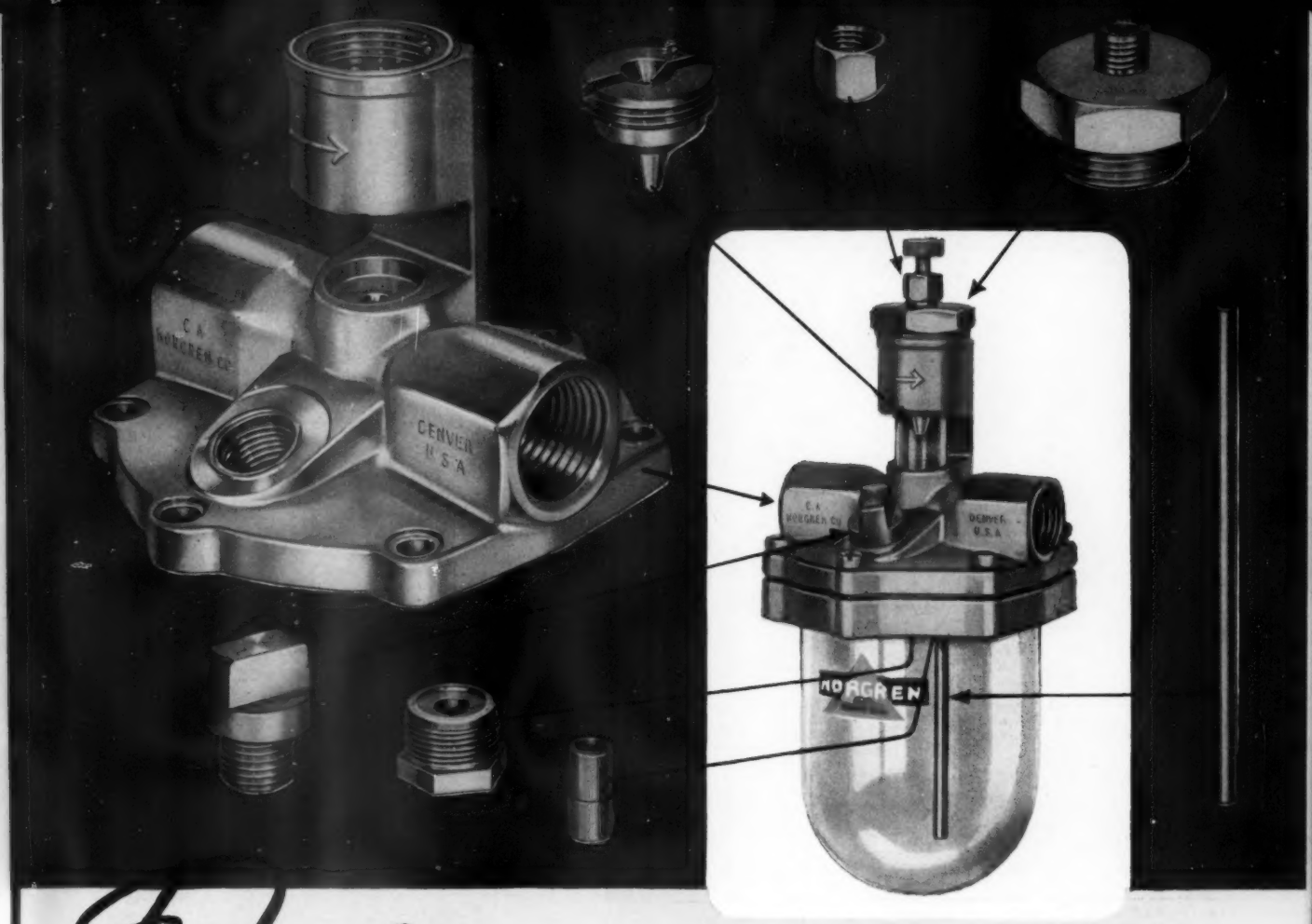
Manufactured by

The LIMA ELECTRIC MOTOR Company

1506 FINDLAY ROAD

LIMA, OHIO, U. S. A.

MAGNETIC POLISHING LATHES . . . GEARSHIFT DRIVES . . . PEDESTAL GRINDERS . . . ELECTRIC MOTORS



Doubling IN BRASS

THE BANDMASTER who boasts of musicians that "double in brass" knows he has an added value —something extra to give his audience. Many manufacturers feel the same way about the use of Anaconda Hot Pressed Parts in their products.

Let's take, for example, the C. A. Norgren Co. of Denver, Colorado, manufacturers of the Norgren Air Line Lubricator illustrated above. This pneumatic tool lubricator is placed in the air line and is automatic in operation—"it starts when the tool starts—stops when the air flow stops."

An Anaconda Hot Pressed Part was selected for the brass body for two reasons: First, this method of manufacture is ideally adaptable to its unusual design. Parts are uniform, more alike than peas in a pod. Clean, smooth surfaces, free of foundry sand, scale and dross, enhance its appearance, help to make machining easy, reduce scrap, increase tool life.

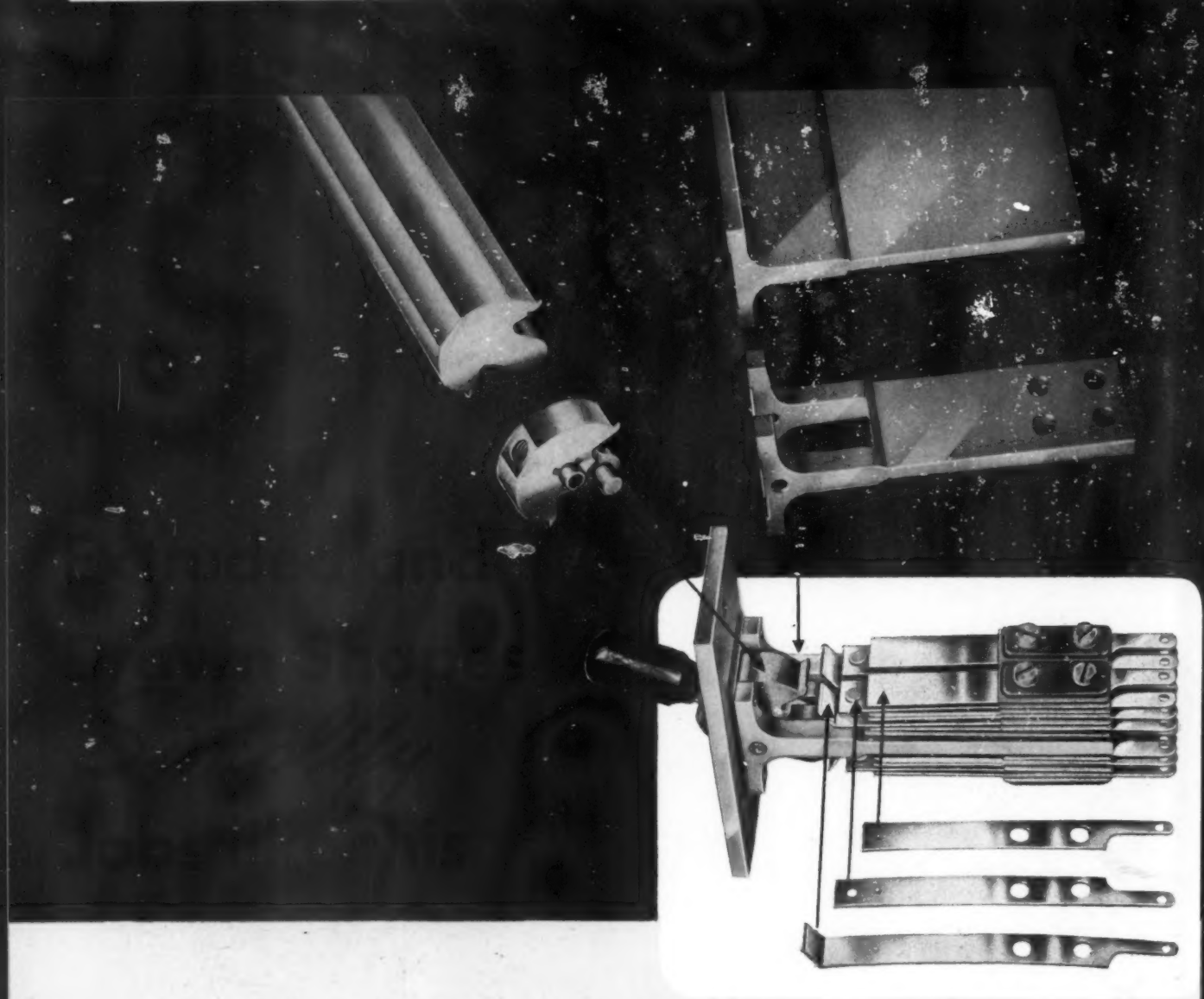
The second reason is even more important: These hot pressed parts have double the strength of ordinary sand castings, yet the total cost—per machined and tested piece—is little, if any, more. Being made of *wrought* metal, they are free from internal defects, are gas, air, oil and watertight . . . assurance of dependable, on-the-job performance.

The screw machine parts also illustrated above have a story of their own, as told by Mr. C. A. Norgren, General Manager:

> "For many years we have used The American Brass Company's free cutting brass rod and tubing. Those were trouble-free years as far as our screw machine operations were concerned. Then came the war with the material controls with which all of us are now familiar. We did what everyone else would have done under the circumstances—shopped the market from Boston to San Francisco. Instead of one source of supply, we found we were purchasing 'free cutting brass' from as many as eighteen different sources.
>
> "Many trade names were lost in the shuffle and, much to our surprise, we found that all brass rod was not *good* brass rod. We found it necessary to give unusual consideration to screw machine jobs where formerly trouble-free operation was the rule. We looked forward with pleasure to the time when The American Brass Company could again fill all our orders without restrictions and we could rely on our vast records of tooling, speeds and feeds which have proved so economical in our screw machine operations."

ANACONDA

Anaconda Copper & Copper Alloys



SIMPLIFICATION IS AN ECONOMIC NECESSITY on an assembly such as this multi-pole, double-throw key switch made by the Kellogg Switchboard & Supply Company of Chicago. Used throughout the telephone industry and by manufacturers of radio, electronic and control equipment, this key, illustrated above in actual size, is made up of more than a hundred component parts—67 of them metal, and most of them copper alloys—from the brass escutcheon to the nickel silver springs.

Simplicity, accuracy and economy go hand in hand in the production of the two most complicated parts of this key—the cam and the frame. These two intricately formed pieces are literally "sliced" off long mill lengths of Anaconda Extruded-and-Drawn Shapes.

The slot milled, ten holes drilled and four tapped, the frame is ready for assembly—providing adequate strength and rigidity, and accuracy of contour and dimensions. The cams are milled to close tolerances, drilled and tapped. Integral pins for the rollers are shell milled—cam action is always smooth, no parts can work loose. Little wonder that similar Kellogg Keys, made of materials supplied by The American Brass Company, are still in service after twenty-five years of "24 hours a day, seven days a week" service on switchboards of some of the busiest exchanges.

Compare this method of producing complicated parts from readily machinable Anaconda Shapes with the costly processes involved by any other method—machining from bar stock or sand castings, stamped parts or built-up assemblies.

The American Brass Company produces copper, brass, bronze, nickel silver and special copper alloys in practically all commercial forms—sheets, strips, plates, wire, rod, tubes, special extruded, rolled and drawn shapes, hot pressed parts and pressure die castings. The manufacture of such a wide range of copper alloy products places us in a position to suggest "the one best metal to do the best possible job for a specific application." Our Technical Department will be glad to work with you.

44138

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut • Subsidiary of Anaconda Copper Mining Company

In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ontario*

ANACONDA

Anaconda Extruded & Drawn Shapes

Here's Trouble-Free Control for Your Machine Tools

Let these three trouble-free motor starters solve your motor control problems. They never need any maintenance. The only moving part is the solenoid plunger that opens and closes the silver alloy contacts with a straight line vertical motion. There are no pivots, pins, or hinges to rust and stick . . . no bearings to gum up . . . no flexible jumpers to break. It's so simple—nothing to get out of order.

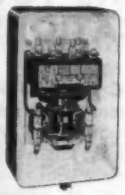
The double break, silver alloy contacts never need any cleaning, filing, or dressing. The oxide which forms on them is as good an electrical conductor as the original contact metal; hence, there is never any need for contact maintenance.

Allen-Bradley starters are easy to install, too. They have plenty of knockouts and lots of wiring space. The white interiors make wiring easy in dark corners.

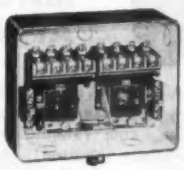
A-B solenoid starters will hold in even when voltage conditions are poor. The overload relays provide reliable motor protection and are easy to reset.

For millions of trouble-free operations, specify Allen-Bradley motor controls.

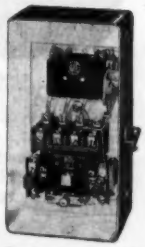
Allen-Bradley Company
1310 S. First St.
Milwaukee 4, Wis.



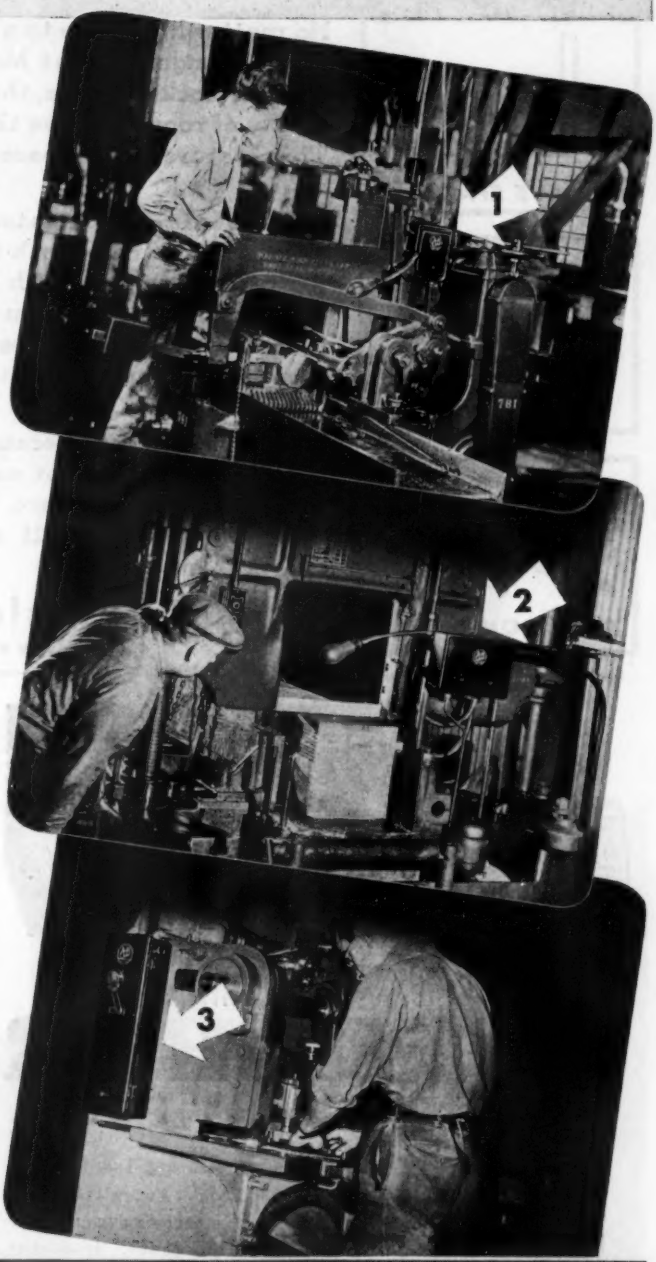
1 Bulletin 709—simplest across-the-line starter for a-c motors. Available in 5 sizes.



2 Bulletin 705 reversing switch. Two Bulletin 709 starters mechanically interlocked so both cannot be closed at same time.



3 Bulletin 712 combination starter and switch in one cabinet.



ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

A-B Quality

Yes, these screws save Time and Space!

No matter how close to a corner or flange you put Mac-it hexagon socket screws, there's plenty of room to drive them. This feature saves space.

★ ★ ★

Mac-its are heat-treated to give far greater strength than plain steel screws. With that extra holding power, you may be able to use fewer screws—save drilling and tapping time.

★ ★ ★

Production tie-ups because of broken screws are not necessary evils. Chances are that standard Mac-its will solve the problem.

Mac-its

PRONOUNCED "MACK-IT"

4311

OTHER MAC-IT PRODUCTS INCLUDE:

Socket head and hexagon head cap screws, stripper bolts, hollow and square head set screws, hexagon socket pipe plugs.

Strong, Carlisle and Hammond Company

Cleveland • Ohio

"NO OUTSIDE PIPING.."

with this type

GUSHER COOLANT PUMP

Suited for today's high-speed production, Gusher Coolant Pumps help you to meet the most urgent production schedules. Simple in design, troublefree, efficient, dependable. Our line includes immersed types, tank units, flange-mounted types; also plain-shaft and belt-driven types. From a dribble to 200 g.p.m. — 1/10 to 2 H.P.

Write for complete new catalog indexed for quick reference.

See Section 5 of New Catalog

Gusher Pumps Patented and Patents Pending

Internal discharge through center of intake eliminates piping.

THE RUTHMAN MACHINERY CO.

1809 READING ROAD CINCINNATI 2, OHIO

The "Gusher" — A Modern Pump for Modern Machine Tools

THE JOHNSON FRICTION CLUTCH

THE NEW "MAXITORQ" IS IDEAL FOR MACHINE TOOL APPLICATIONS

Single "MAXITORQ" FLOATING TYPE MULTI-DISC CLUTCHES are recommended for power transmission applications where smooth engagement, quietness, cool running without drag and quick, positive disengagement are required. They are especially adaptable to machine tool use and other types of industrial machinery where the ultimate in clutch action is of paramount importance.

Send at once for dimension sheets and specifications

Features include floating discs which assure minimum drag, easy manual assembly and quick easy adjustment. They are compact, simple and require minimum attention. Made in capacities from ½ HP to 5 HP at 100 R.P.M. in single, double and cut-off coupling types.

Double

WRITE FOR MULTI DISC CLUTCH CATALOG NO. 62 OR CONSULT SWEET'S OR THOMAS' REG.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER

How many man-hours can you spare FOR NEEDLESS TAPPING?

Sperry saves machine shop time on Aircraft Controls with the SIMPLER P-K Fastening Method

Sperry Products, Inc., Hoboken, N. J., make the Exactor Hydraulic Remote Control widely used on aircraft, army and navy vessels, and in many war plants. Their heavy production schedules can be met only by ruling out every needless assembly operation. That's why Sperry uses Parker-Kalon Self-tapping Screws wherever possible to eliminate tapping.

"At a busy time like this," says a Sperry Engineer, "it's a great relief not to have to tap holes for machine screws. All our tapping is done in our machine shop, which is up to its neck in other work. Tapping these parts would tie up machines needed for other important operations, and production would be seriously delayed."

Can you spare scarce man-hours for needless tapping? *Question every fastening job!* See if it can be done the simple, Self-tapping Screw way before putting up with slow, complicated methods. Experience proves that, in 7 out of 10 cases, P-K Self-Tapping Screws will simplify metal and plastic fastening jobs . . . save time . . . speed production . . . lower costs . . . and often increase fastening strength.

Call in a P-K Assembly Engineer for help on your fastening problems. You'll find his advice unbiased. If you prefer, mail a brief description of fastenings for recommendations. Parker-Kalon Corporation, 208 Varick Street, New York 14, N. Y.

EIGHT P-K TYPE "F" SCREWS are used to fasten a gasket retainer to the transmitter cover. Screws are driven through the metal gasket retainer and gasket into the aluminum cover.

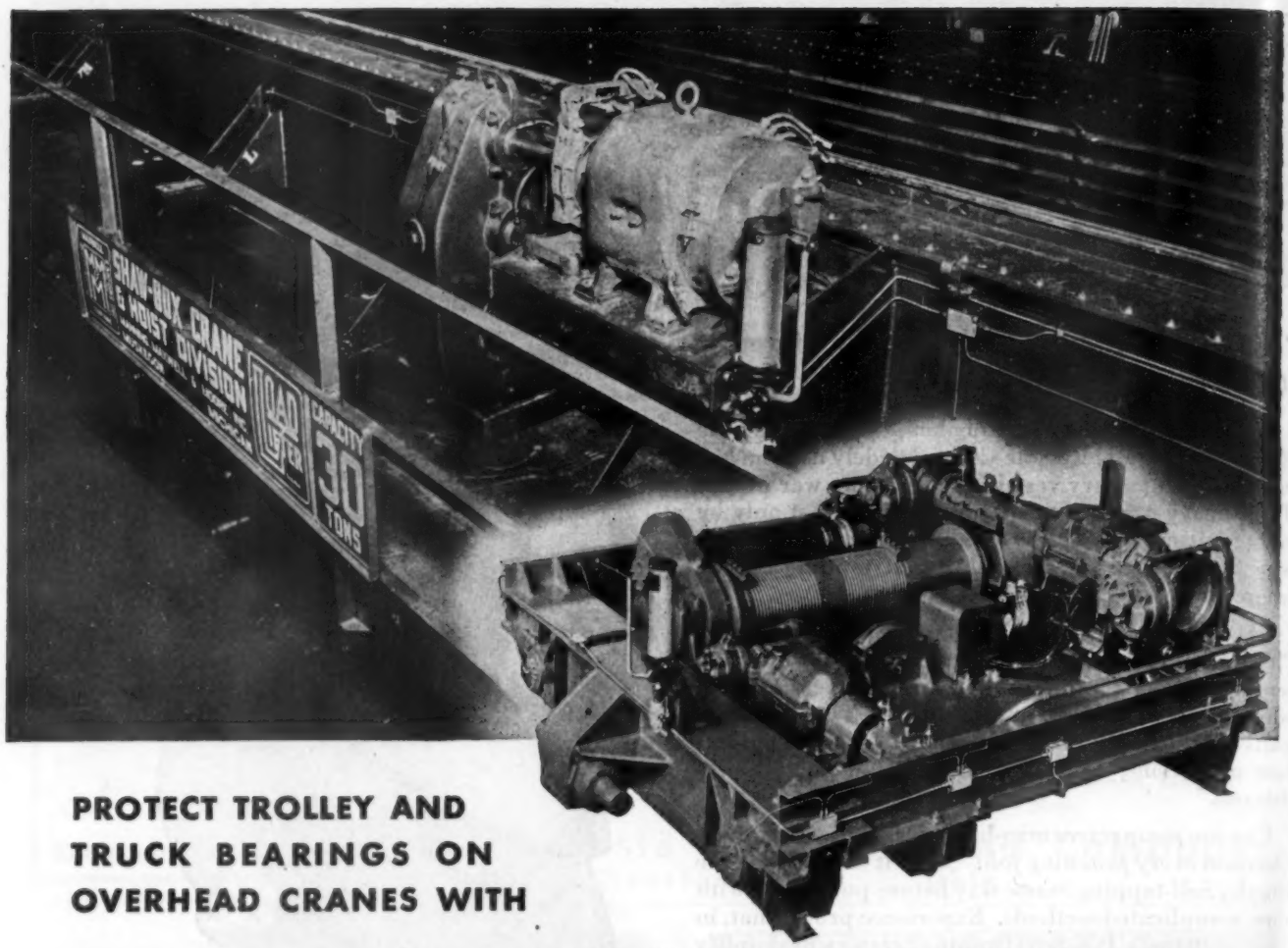
Four P-K Type "U" Screws are also used to fasten a metal name plate to each unit.

SELF TAPPING SCREWS FOR EVERY METAL AND PLASTIC ASSEMBLY

PARKER-KALON

Quality-Controlled

SELF-TAPPING SCREWS



PROTECT TROLLEY AND TRUCK BEARINGS ON OVERHEAD CRANES WITH

TRABON LUBRICATING SYSTEMS

prevent injuries and tie-ups . . . get longer, more dependable bearing life

"Striking the floor with a sickening thud, a crane operator in Buffalo met sudden death a short time ago. He'd been lubricating his crane — a routine operation — slipped and fell — leaving a grief-stricken family — and more than $18,000 compensation charges."

These accidents are unnecessary! That $18,000 would have equipped 8 to 10 cranes with automatic lubrication—and saved the man's life—because Trabon lubrication makes absolutely certain that every connected bearing, whether large or small, moving or stationary, receives just the desired amount of lubricant, *while the machine is running.* Trabon avoids costly downtime while a man crawls around lubricating each bearing individually,— the breakdown if he misses one,— the lost time, and costs, of accidents,— makes the bearings last longer.

On overhead traveling cranes, costly steel mill equipment, forging presses, brakes, shears, crushers, *and other machines and machinery of all kinds,* Trabon lubrication for years has been meeting every operating requirement. More complete details—including engineering bulletins of interest to every works manager, designer, operating and maintenance superintendent—furnished gladly—no obligation. Write for Bulletins today.

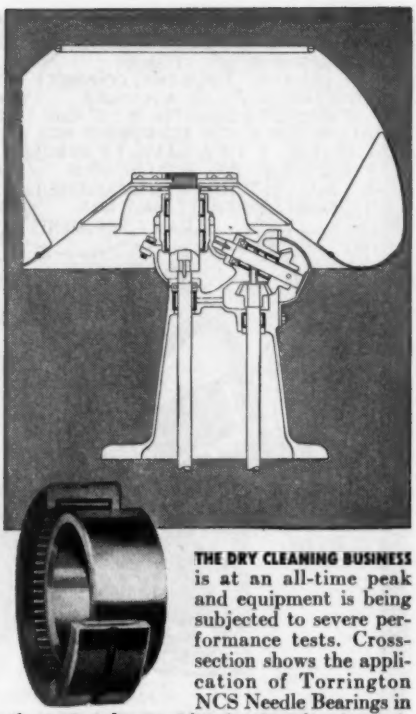
TRABON
ENGINEERING CORPORATION

1819 *East 40th Street* • *Cleveland, Ohio*

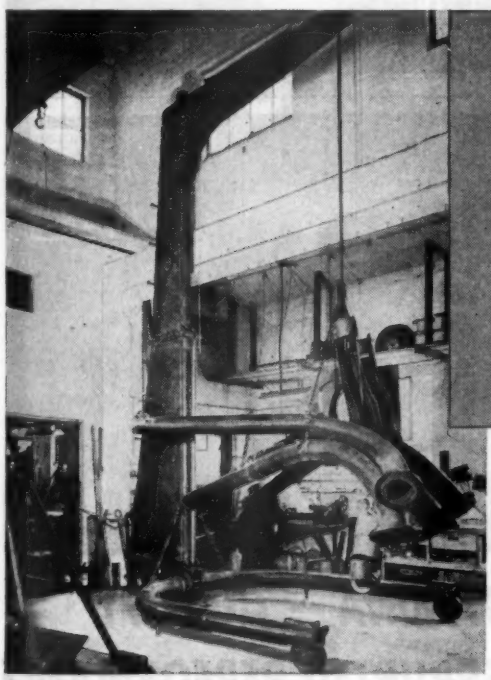
INDUSTRIAL LUBRICATION EXCLUSIVELY SINCE 1922

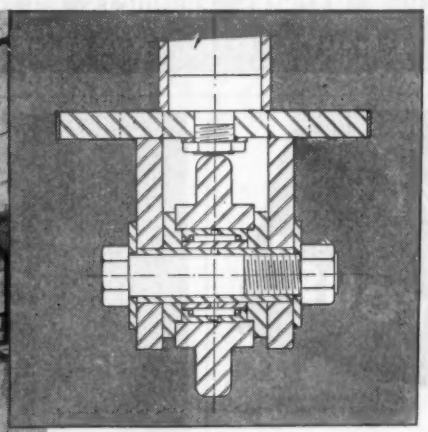
IN THE NEWS
WITH TORRINGTON BEARINGS

A 95-FOOT "STRETCH" is available through this Hi-Reach Platform Telescoper, product of the Economy Engineering Company, used for plane and hangar maintenance by our Army Air Forces. Torrington Type DC Needle Bearings were supplied for the twenty-two hoist mechanism sprocket shafts. These bearings were selected because of their compact design features coupled with extremely high capacity, permitting light but strong construction in the telescoping mechanism.

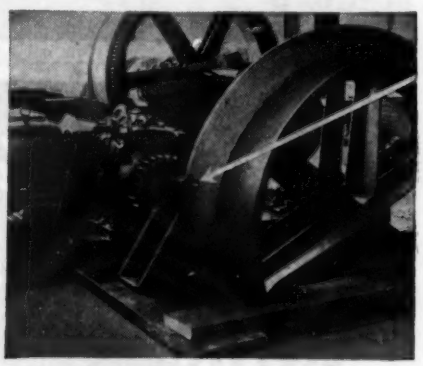


THE DRY CLEANING BUSINESS is at an all-time peak and equipment is being subjected to severe performance tests. Cross-section shows the application of Torrington NCS Needle Bearings in the pedestal assembly of a dry cleaning unit manufactured by Columbia Appliance Corporation. Now operating almost continuously day after day, these compact anti-friction bearings are demonstrating the advantages of their high capacity and long service life under heavy load conditions.





THIS PORTABLE HYDRAULIC HOIST, manufactured by Federal Aircraft Works primarily for aircraft engines, handles other heavy parts with equal facility. Cross-section shows installation of Torrington Type NCS Needle Bearing in the hydraulic ram sprocket, where it is subject to extremely heavy loads. Its low coefficient of friction is an important factor in contributing to smooth, anti-friction operation.



CAM FOLLOWERS have proven to be an interesting application of Torrington Type RC Needle Bearings in the wire manufacturing machinery of New England Butt Company. They are used to impart a "wobble" motion to the loose fitting ring on the drum of the capstan, the ring guiding the wire so that it "lays" correctly on the drum which revolves at a maximum speed of 125 feet per minute. The high capacity and elimination of stress concentrations of these heavy duty Type RC Torrington Needle Bearings make them ideal for this purpose.

TORRINGTON-BANTAM ENGINEERS, with long experience in the design and manufacture of anti-friction bearings of every major type—tapered roller, straight roller, needle and ball—are in an unusual position to give expert assistance in the design and selection of the correct bearings for any given application. For assistance with today's or tomorrow's bearing problems, TURN TO TORRINGTON.

ARMY E NAVY

TORRINGTON BEARINGS

STRAIGHT ROLLER · TAPERED ROLLER · NEEDLE · BALL

THE TORRINGTON COMPANY · BANTAM BEARINGS DIVISION

SOUTH BEND 21, INDIANA

OUT OUR WAY
BY J. R. WILLIAMS
WHAD-DA-YA MEAN--- TOLERANCES REVERSED? I CHECKED M'SELF AND IT'S ALL RIGHT!
I MEAN YOU CAN'T CONVINCE ME A PLUNGER DIAMETER OF 2.5" PLUS .005 AND MINUS.0 WILL FIT A SLEEVE 2.5" MINUS .005. YOU GOT YOUR TOLERANCES BACKWARDS ON THE MALE AND FEMALE COMPONENTS
THE OLD BULL IS TRYING TO KEEP THE DRAFTING DEPARTMENT FROM CROWDING A SIZE 9 HEAD INTO A SIZE 7 HAT
YEAH, HE'S GETTING A GREAT KICK OUT OF SHOWING UP THE CHIEF DRAFTSMAN. THEY'LL FIGHT LIKE KILKENNY CATS BUT WATCH 'EM GET TOGETHER WHEN SOME OUTSIDER STICKS HIS NOSE IN. THEN THEY'RE THICK AS THIEVES. THE AXIS'LL FIND THAT OUT
A NATIONAL TRAIT
J.R.WILLIAMS

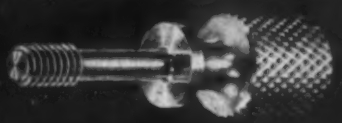
Another Victory for The 'Old Bull'

The "Old Bull" and millions like him aren't ready to take it easy yet. Wars and races aren't won at the start—it's the finish that counts and he's pushing all hands to keep our fighting men better equipped to win Victory sooner. It's the production at a war-time pace that has taught us how to make the finest precision parts quicker, better, at lower cost than ever before.

And it will be precision and precision parts that will make these United States a country where the millions can enjoy what was once only within the means of the few.

(Below) A few of the many thousands of our precision parts that help "Keep 'em flying and fighting." Let's all back the attack—Buy EXTRA War Bonds

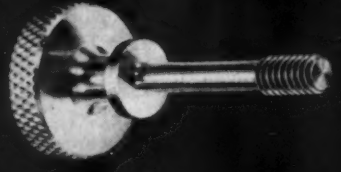
ERICSSON ESTABLISHED 1911



ERICSSON

SCREW MACHINE PRODUCTS CO., INC.

25 LAFAYETTE STREET, BROOKLYN 1, N. Y.



Here's a Pump that's "Ambidextrous"

TUTHILL

Automatic Reversing Pump Delivers From Same Port Regardless of Direction of Shaft Rotation.

Reversing shafts can't stump this Tuthill Model R Pump. You can drive it in either direction of rotation without changing the flow of the pumpage. It requires no check valves. It automatically solves the problem of driving a pump from a reversing shaft and provides the answer where the ultimate direction of shaft rotation is not known. These internal-gear rotary pumps are available in sizes from 1 to 50 g.p.m. and pressures up to 100 p.s.i. Write for complete catalog.

Tuthill Pumps are Serving Army • Navy Air Force Merchant Marine

TUTHILL PUMP COMPANY

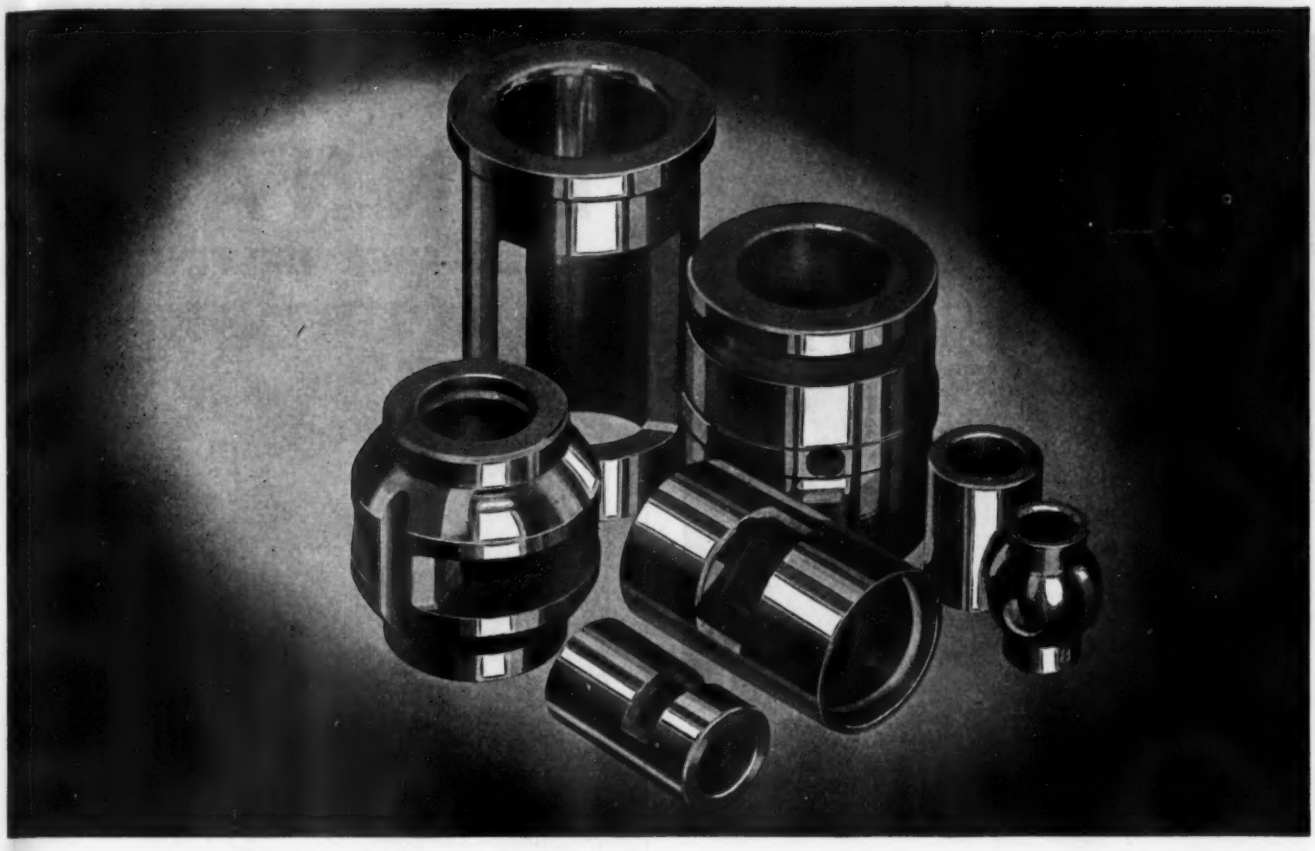
939 E. 95th ST. • CHICAGO 19, ILLINOIS

STAMINA — QUALITY
UNINTERRUPTED PERFORMANCE

ABBOTT'S 35th YEAR • Specify "ABBOTT" •

THE ABBOTT BALL COMPANY, HARTFORD 10, CONN., U.S.A.

ROLL ON ABBOTT Bearing BALLS



Electric Motor Bearings

The performance and the service that you gain from your electric motors depends to a very great extent on the bearings you install. Quality should be your first thought when purchasing bearings—either for new equipment or for replacement.

Johnson Electric Motor Bearings are the highest quality available. Cast in a special high lead bronze alloy they deliver the smoothest performance for the greatest period of time. The plastic quality of this alloy permits a reasonable amount of overloads, misalignment, and prevents grit from scoring the shaft.

Johnson Electric Motor Bearings are usually available from stock for over 250 different types of motors. Each bearing is completely machined to the correct tolerances . . . ready for immediate installation. Oil holes, slots or grooves are in accordance with the requirements of the motor.

The next time you need bearings, specify Johnson Bronze. Test them in comparison with any you have ever used. See for yourself the extra service and performance you gain.

Catalogue

72 Pages listing and describing the most complete bearing service available. Electric Motor Bearings are illustrated. Write for your copy TODAY.

JOHNSON BRONZE

SLEEVE BEARING HEADQUARTERS

The MOST COMPLETE SLEEVE BEARING SERVICE in the WORLD

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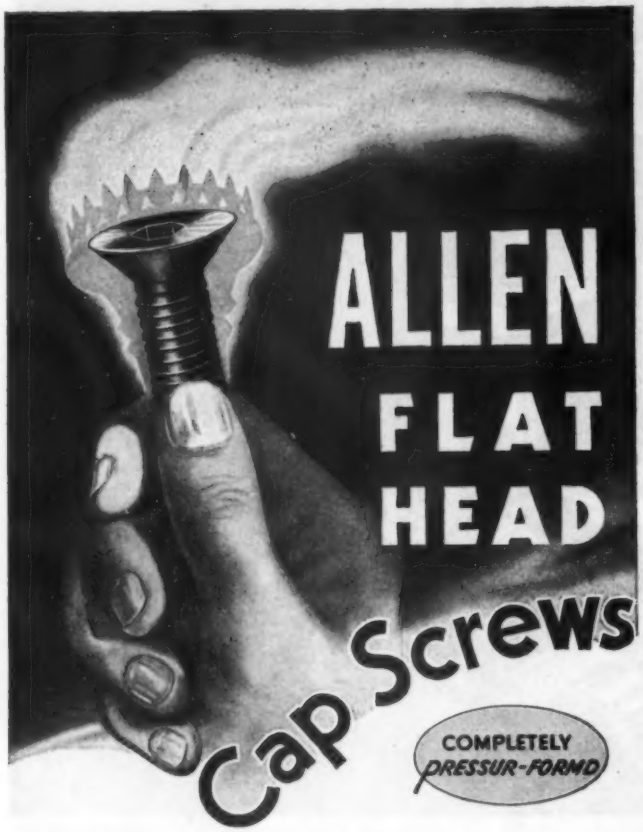

This Cap Screw design lights your way to attain great rigidity of grip, while retaining flush surfaces of machine parts and assemblies. Sets up flush and true when seated in countersunk hole.

It's *"pressur-formd"* by Allen processes from end to end so the steel-fibres are continuous and uncut under the head, to accentuate strength of the socket. Threads also are *pressur-formd,* which makes the axial fibres of the steel conform to the contours of the thread profile, with greater resistance to stripping. Thread tolerances are held to a high Class 3 fit, for a high degree of frictional holding-power under vibration.

Obtainable as a part of the ALLEN Line from your local Industrial Distributor. *Ask for samples,* with dimensional data on available sizes.

THE ALLEN MFG. COMPANY
HARTFORD, ★ **ALLEN** ★ CONN.

For Real Economy
equip with . . .

TANNATE
LEATHER BELTING

. . . for primary drives—for modern group drives—for pivoted motor base drives—for machines—Tannate.

Tannate has great strength and an exceptional pulley grip that keeps machines producing at high-speeds even under varying loads and so maintains maximum output. It is resistant to moisture, machine oils and many weak chemicals.

Stronger than most first quality oak belting, Tannate outlasts ordinary belts. Little maintenance is needed to secure long, trouble free service even when running on 3 shift daily operation. However, occasional applications of Rhoads Belt Preserver are recommended.

Rhoads Engineering advice may show you the way to get real belting economy—with Tannate.

for EFFICIENT, ECONOMICAL SERVICE
Equip with **RHOADS**
Tannate
WATERSHED
LEATHER BELTING

—Established 1702—

J. E. RHOADS & SONS
35 N. SIXTH ST., PHILADELPHIA 6, PA.
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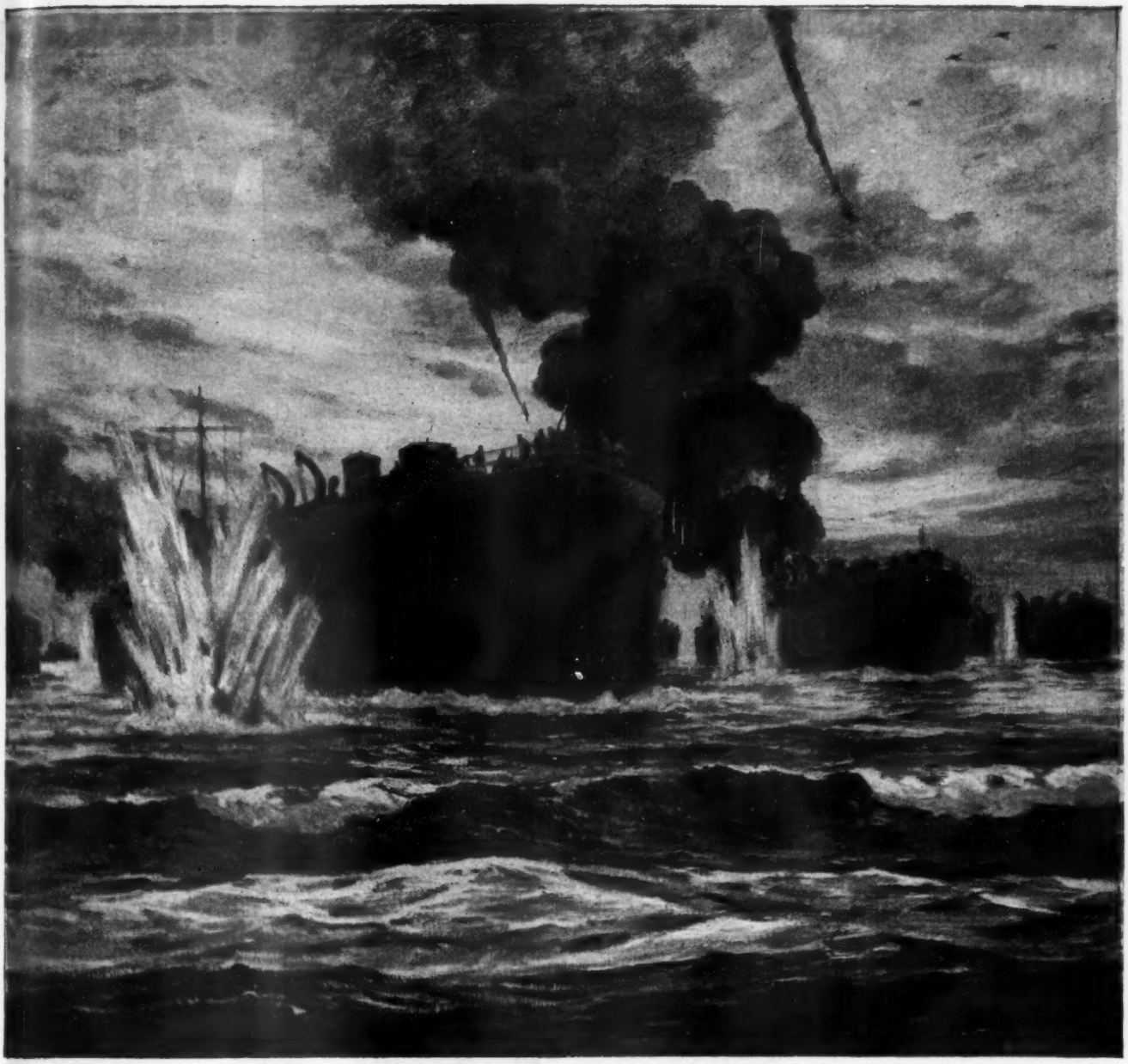


AVAILABLE ON REQUEST . . . Handsome full-color 10" x 10" reproduction of this dramatic painting of the "Green Dragons" by Lt. Commander Anton Otto Fischer, the internationally famous marine painter. No advertising matter.

When the Green Dragons Strike

Fearfully and wonderfully made are the LST's—Landing Ships, Tanks—the "Green Dragons" of the Allied Invasion Forces. When their prows touch the enemy beaches giant jaws gape open and spew forth a small mechanized army—tanks, mobile artillery, heavily armed fighting men. Another beach head is established, to have and to hold! Aboard ship, unfailing ventilating systems are required to remove the poisonous exhaust gases of warming up motors in the cavernous tank deck. Accordingly every LST is equipped with high speed blowers, driven by Star Electric Motors. So much power is packed into each motor that two alone will ventilate the hull, giving a wide margin of safety needed in ships that face the full force of enemy bombing and shell fire. Also, aboard each LST there's a Star gear motor to operate the elevator—to lift or lower fighting tanks and trucks. At sea or in industry—"in the tight spots, it's a STAR."

STAR ELECTRIC MOTOR COMPANY, BLOOMFIELD, N. J.

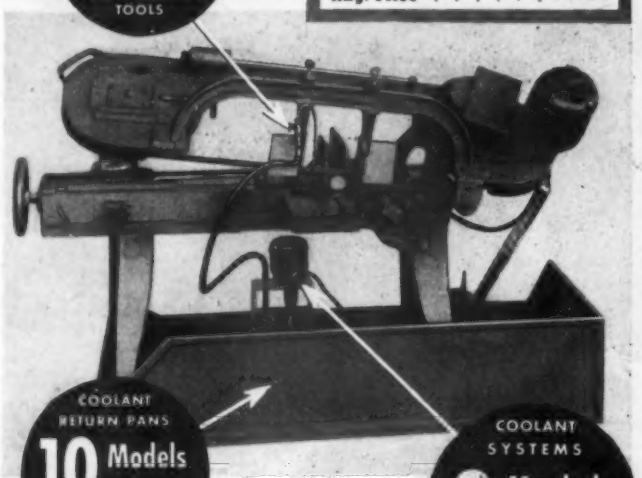
STAR MOTORS

POWER PACKAGED AS YOU NEED IT

COMPLETE EQUIPMENT FOR ADDING AN *Automatic Coolant System* TO ALL MACHINE TOOLS

NEW... FOR ALL HORIZONTAL BAND SAWS—Increase Production and Increase Blade Life—equip your saw for coolant cutting with a Gray-Mills Model S-30 system. You simply set the saw upon the coolant pan—hook up the feed tube—plug in the cord—and your saw is ready for wet cutting. Price **$79.50**

FEED FITTINGS **11** Models FOR ALL TYPES OF MACHINE TOOLS



COOLANT RETURN PANS **10** Models FOR ALL TYPES OF MACHINE TOOLS

COOLANT SYSTEMS **9** Models GEAR AND CENTRIFUGAL 60 to 2200 G.P.H. 8 to 50 P.S.I.

The New S-30 System is an improved design of the Gray-Mills S-20 System. It has an improved gear type pump with automatic pressure relief valve.

Gray-Mills' exclusive slotted feed tube for saw blade application; the flow control petcock above the feed; control switch in the cord; and special forced-settling baffles for separating chips from the coolant are other S-30 features.

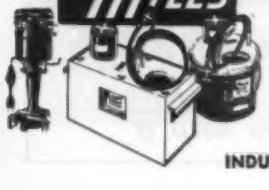
It's easy and economical to equip any of your machine tools with a Gray-Mills Portable Coolant System—to give them the tool-saving and production-increasing advantages of using coolants. Gray-Mills Systems include a complete range of pumps, coolant return pans and fittings for quick and simple application to most any machine tool. Varied pump capacities, both gear and centrifugal, are available to provide proper pressure and volume for the job.

See your distributor or write for complete details.

PROMPT DELIVERY

GRAY-MILLS CO., 1953 Ridge Ave., Evanston, Ill.

GRAY-MILLS



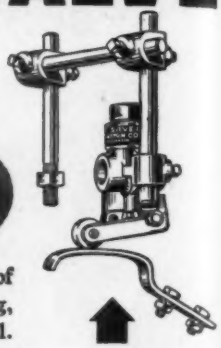
Complete Portable

COOLANT SYSTEMS

FRACTIONAL H. P. PUMPS

INDUSTRIAL FLUID REFRIGERATING SYSTEMS

AIR-SAVER *Leak Proof* AIR VALVE



- Use wherever a controlled blast of air is needed for cleaning, drying, cooling or ejecting. Easy to install.
- Mount in any position. Operates at any angle. Provides extra large air volume. Clean seal, a long wearing valve designed to stay leak proof. Manufactured and guaranteed by Briggs and Stratton Corp., and marketed nationally by

Valve, mounting rods and operating cam, complete as shown.

$12.50 *f. o. b. Detroit*

Weight Four Pounds.

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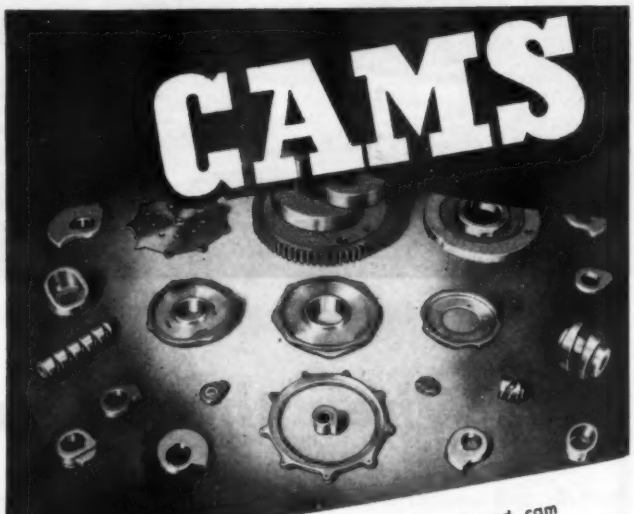
CAMS



LET the largest, most completely equipped cam milling and grinding plant in the mid-west handle your cam problems. All sizes of drum, face, groove or other styles of cams cut to order in quantities of one or one thousand. Send specifications or blueprints for a quotation on your requirements.

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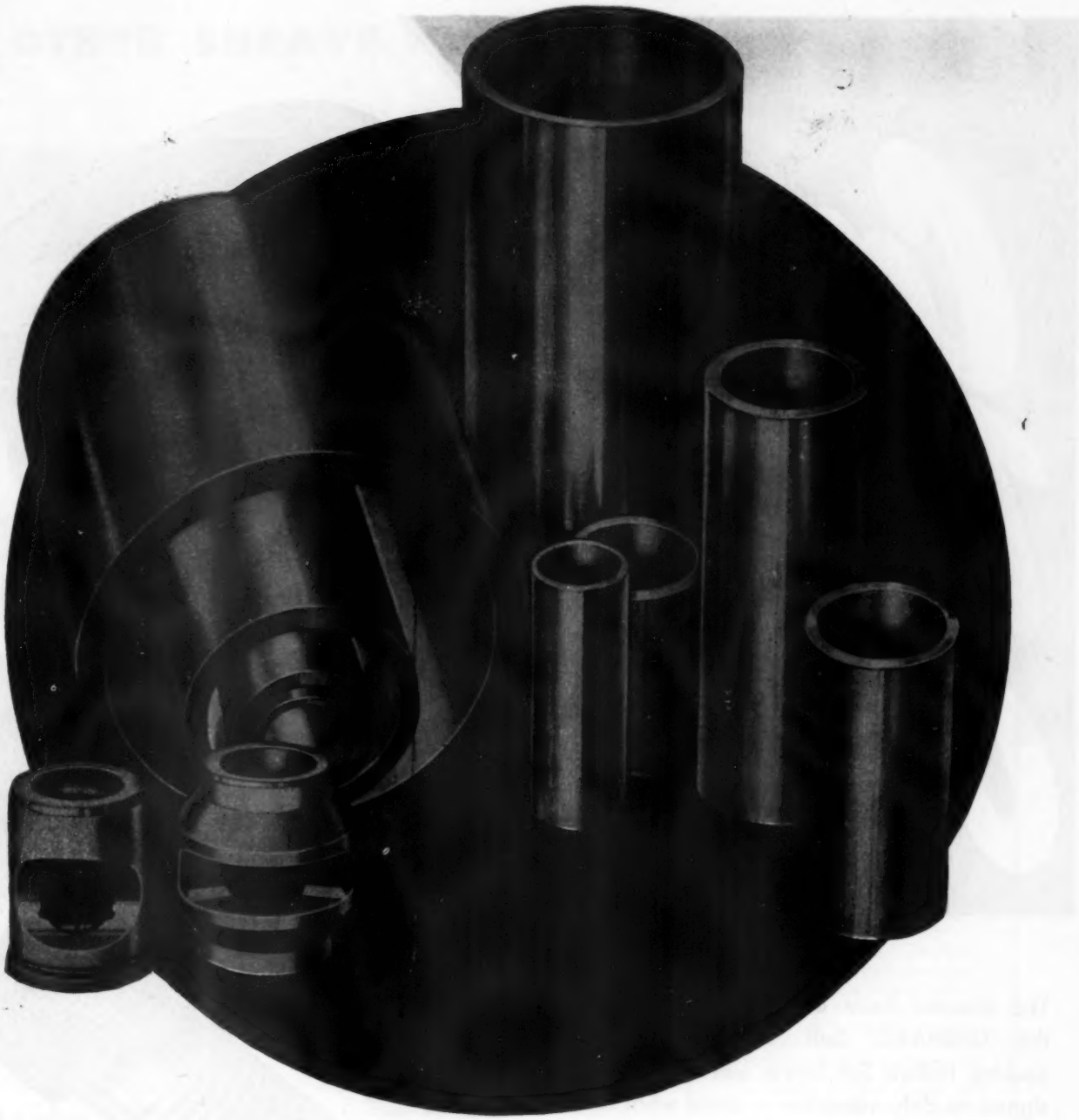

In engines for combat planes, trainers, and transports —in landing gear and controls—in transmissions and final drives of tanks and amphibians—in trucks, ducks, jeeps and gun mounts—Bunting Cast Bronze Bearings are doing extraordinary duty in modern war.

For the future machines of peacetime Bunting will offer the advanced Cast Bronze Bearings which war has helped to develop.

Finished bearings, ready to install in machinery of every kind, and Bunting Factory Finished Tubular and Solid Bronze Bars are available from stock. Ask your wholesaler. Write for catalog.

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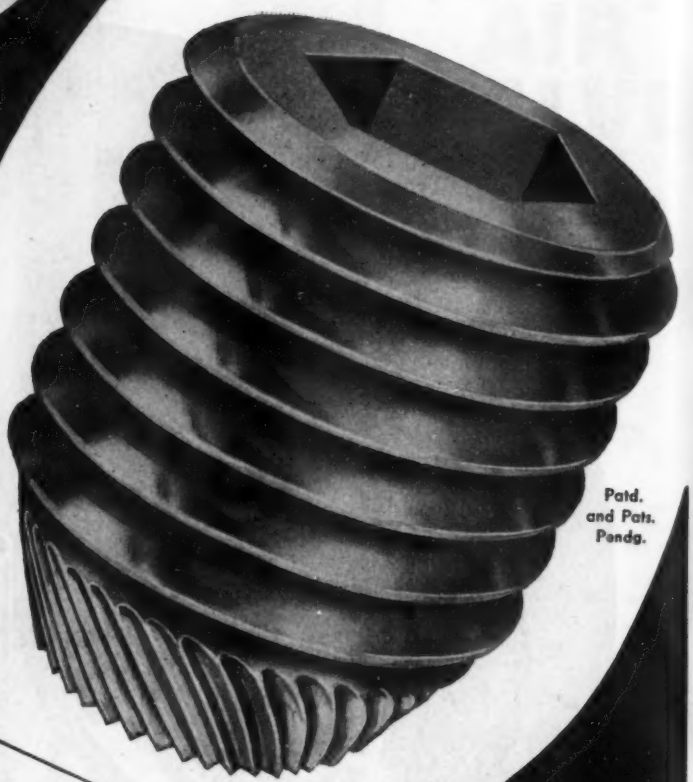


Patd. and Pats. Pendg.

"UNBRAKO" Self - Locking HOLLOW SET SCREWS with the Knurled Points

UNBRAKO

REG. U. S. PAT. OFF.

The Knurled Point of the "UNBRAKO" Self Locking Hollow Set Screw was specially designed to defy vibration — come what may. The knurling of the point provides sharp ridges and points which, when the screw is tightened as usual, dig in firmly and positively prevent unwinding due to vibration, thereby eliminating an important cause of breakdowns. The ridges, it can be seen, have a counter clock-wise slant to still further discourage unwinding. Yet it can be removed without difficulty if necessary by use of the socket wrench and used over and over again. Sizes: No. 4 to 1½" diameter. Full range of lengths.

KNURLED "UNBRAKO" SOCKET HEAD CAP SCREWS

Preferred by mechanics because the knurling affords a firm, non-skid grip for the fingers, handiest of wrenches. Last time and wasted motion are eliminated and assembly thereby stepped up considerably. Sizes: No. 4 to 1½" diameter. Full range of lengths.

Knurling of Socket Screws originated with "UNBRAKO" years ago.

"UNBRAKO" SOCKET HEAD STRIPPER BOLTS

Knurled and ground; another time saver of this well liked line. Made of Nickel-alloy steel. Immediately available from stock in a great variety of diameters and lengths.

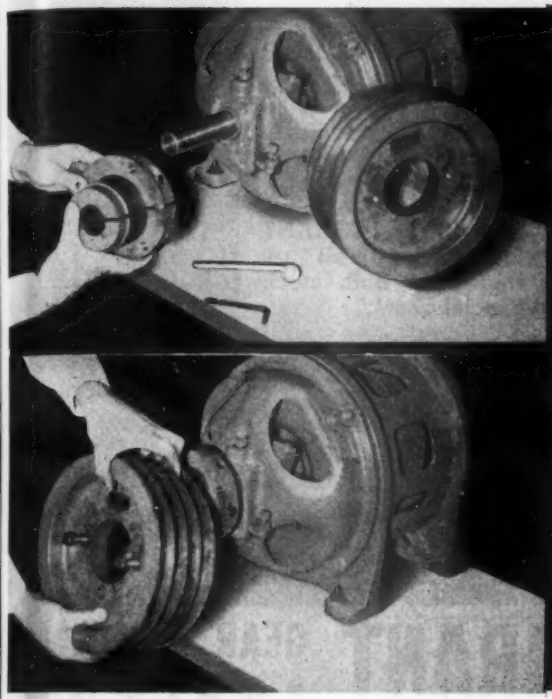
Send for the "UNBRAKO" Catalog of Screw Products. You'll find it a source of useful information.

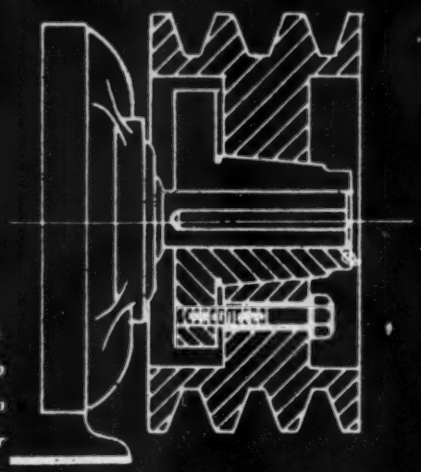
OVER 40 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA., BOX 4 · BRANCHES: BOSTON · DETROIT · INDIANAPOLIS · CHICAGO · ST. LOUIS · SAN FRANCISCO

NO OTHER SHEAVE HAS THESE 3 ADVANTAGES





Split hub makes installation easy. Hub stays put—only rim is changed. Bigger pull-up bolts—higher taper cone pressure.

Worthington's QD Sheave is easy to get on, easy to get off, yet always tight on the shaft

If you have ever been in the shop when old-fashioned sheaves were being changed . . . saw workmen sledging and prying and sweating to get one off and another on . . . got an earful of loose fits, tight fits, misalignment, then you'll appreciate these advantages of Worthington's QD sheaves.

With the QD, the hub stays put, because a variety of sizes of rims fit it. When changes are made for different speeds, the rim is easily removed and replaced. On all other sheaves, the hub has to be loosened, presenting a realignment problem when the hub is drawn up to the rim. Once you put on the hub of the QD sheave, alignment problems are permanently solved.

These advantages, plus those of the Worthington-Goodyear Endless Cord V-Belts, make the Worthington Multi-V-Drive the most trouble-free method of driving by V-belts.

Stock size sheaves and belts are available at strategic centers throughout the country.

SELECT A MULTI-V-DRIVE THE WORTHINGTON WAY with this simplified, easy to handle Master Manual

You can select the right drive to fit your job exactly in three minutes by the watch—using just plain everyday arithmetic.

Scientifically evaluated, after years of laboratory tests, all factors affecting V-Belt life and V-Belt efficiency were taken into consideration so that each selection is guaranteed to give peak performance under all conditions for which it is recommended.

This 72 page indexed manual does your Multi-V-Drive engineering for you. Be sure to get your personal copy.

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WORTHINGTON PUMP AND MACHINERY CORPORATION
Standard Products Div.
Harrison, N. J.

WORTHINGTON *BEHIND THE NAME*

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Worthington Pump and Machinery Corporation
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Please send me a copy of the Worthington Master Manual.

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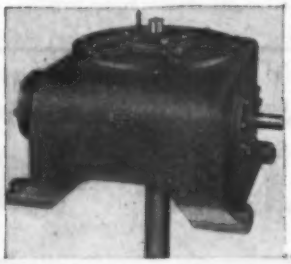
Old LST Number 385 has plowed into the beach to deliver essential war materiel to the doughboys that are fighting to hold the beachhead. . . . She's got her nose deep in the sand and must quickly back out for more "stuff" that'll help our G-I's in their battle with the enemy. . . . This back-out is easily done with the aid of a D.O.James 120 HV Worm Gear Reducer that is attached to the winch that pulls on the anchor—"*heave-ho my hearties and off she floats.*" ★ Since 1888 we have been privileged with many opportunities of solving the power-saving problems of American industry . . . and now with such varied war time requirements the D.O. James line of Gear Speed Reducers of every type will prove an aid to you in the solution of your power-saving problems.



D.O. James Worm Gear Reducers are available in 26 sizes with a ratio range of 6 to 65:1 and from 1/32 to 150 horsepower. Either horizontal or vertical drive and in the Standard Reducer or Motorized.

D.O.James

ESTABLISHED 1888 MANUFACTURING CO.
1140 WEST MONROE STREET · CHICAGO 7, ILL.

"When your specifications call for special gears — Spur — Bevel — Mitres — Helical — Worms and Worm Gears — Reduction Units — Why not try GRANT.

You will find GRANT service meeting all requirements of both stock and special gears."

GRANT GEAR WORKS BOSTON

Gear Specialties

SPURS • HELICALS • BEVELS
(Straight & Spiral)
WORM GEARING • THREAD GRINDING
(14 to 96 D. P.)

This range logically embraces the gear components of many critical control devices essential to the war effort and this organization is proud of its contributions of such material in the program.

With full *production capacity* scheduled far into the future, all new inquiries are now necessarily subordinated to these vitally important prior commitments. However, every *urgent* need will be given careful consideration.

Gear Specialties
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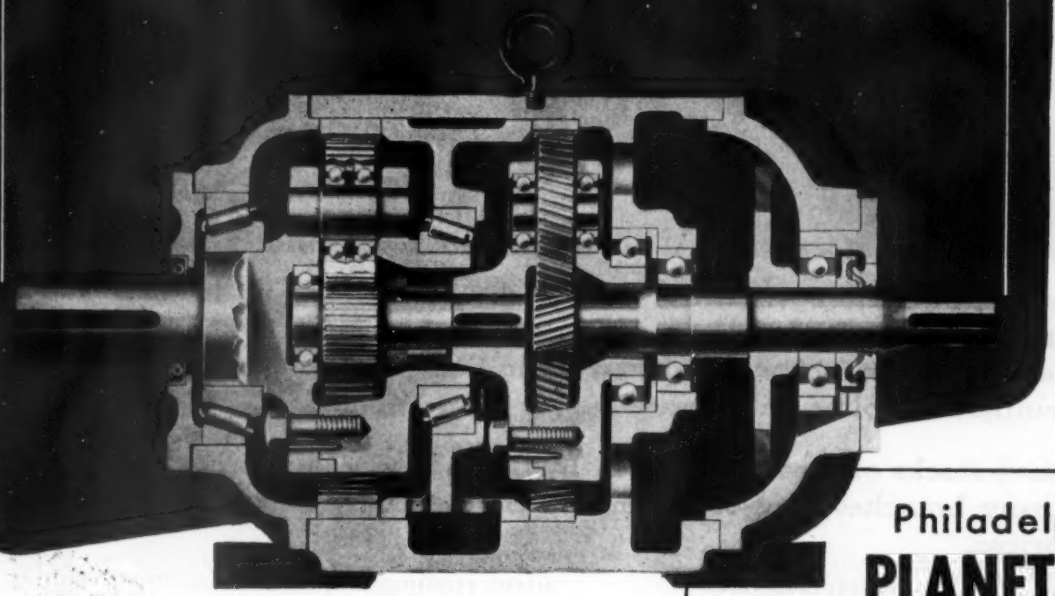
← a STRAIGHT LINE →



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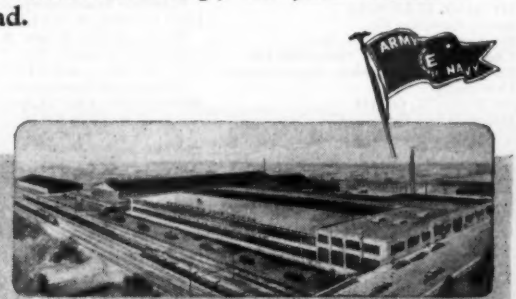
PLANETARY
Speed Reducer

...the Shortest Distance to Efficiency!

• The straight line or concentric shatt type Philadelphia Planetary Speed Reducer is well suited to drives where space is limited, where a neat appearance is desired, and where a simple baseplate design is preferred. The planetary type gearing is precision made of heat treated steel, and mounted entirely on ball or roller bearings. The sun pinions each mesh with three equally spaced idlers, thus reducing pitch line velocity, noise and wear. The idler gears are supported on both ends rather than being overhung as in some planetary designs.

Gear ratios cover a range of 4:1 to 106:1, with sizes up to 100 horsepower. Efficiencies up to 98% are obtained.

Complete details are covered in our Bulletin 100. Write for a copy on your business letterhead.



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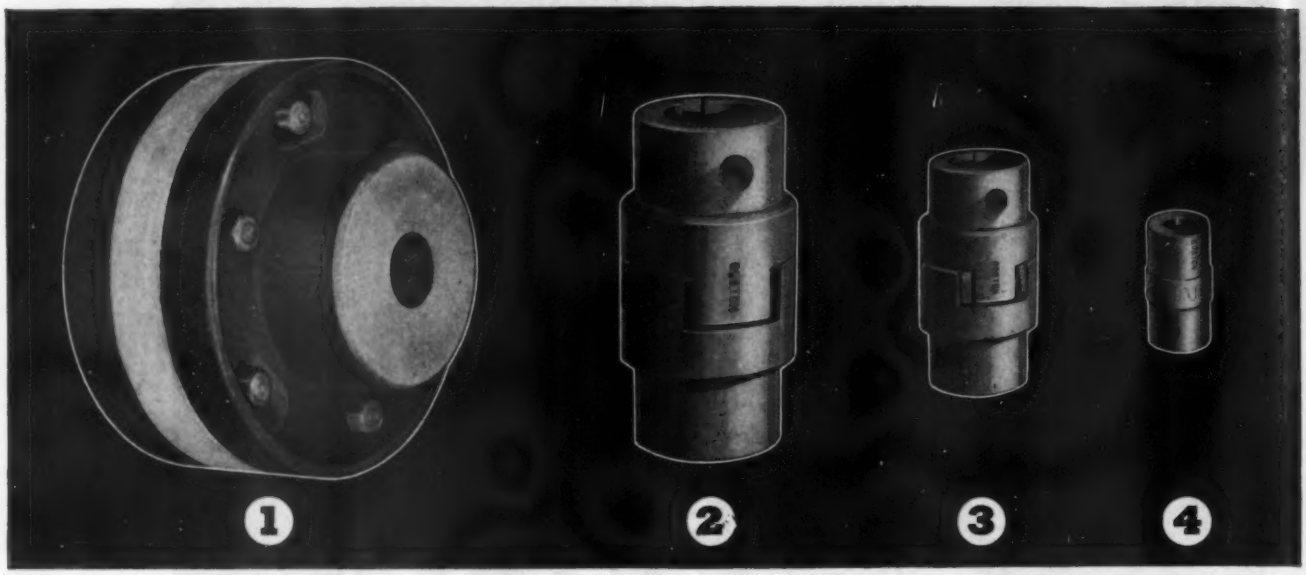
GEAR WORKS INCORPORATED
ERIE AVE. AND G ST., PHILADELPHIA 34, PA. NEW YORK • PITTSBURGH • CHICAGO

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

FLEXIBLE COUPLINGS



A complete line of couplings: (1) the Renold-Hardy for loads up to 600 horsepower; (2) the "FCN" with non-metallic insert and (3) the "FCB" with ball bearing insert, each with bores ranging from 3/8" to 1 1/2"; and (4) the "FA" multijaw coupling with bores ranging from 3/16" to 1/2".

Representative stocks of these are carried by the following authorized distributors and direct company branches, any of whom will be glad to give you complete specifications and prices.

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ALLENTOWN, PENNSYLVANIA
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BOSTON GEARS

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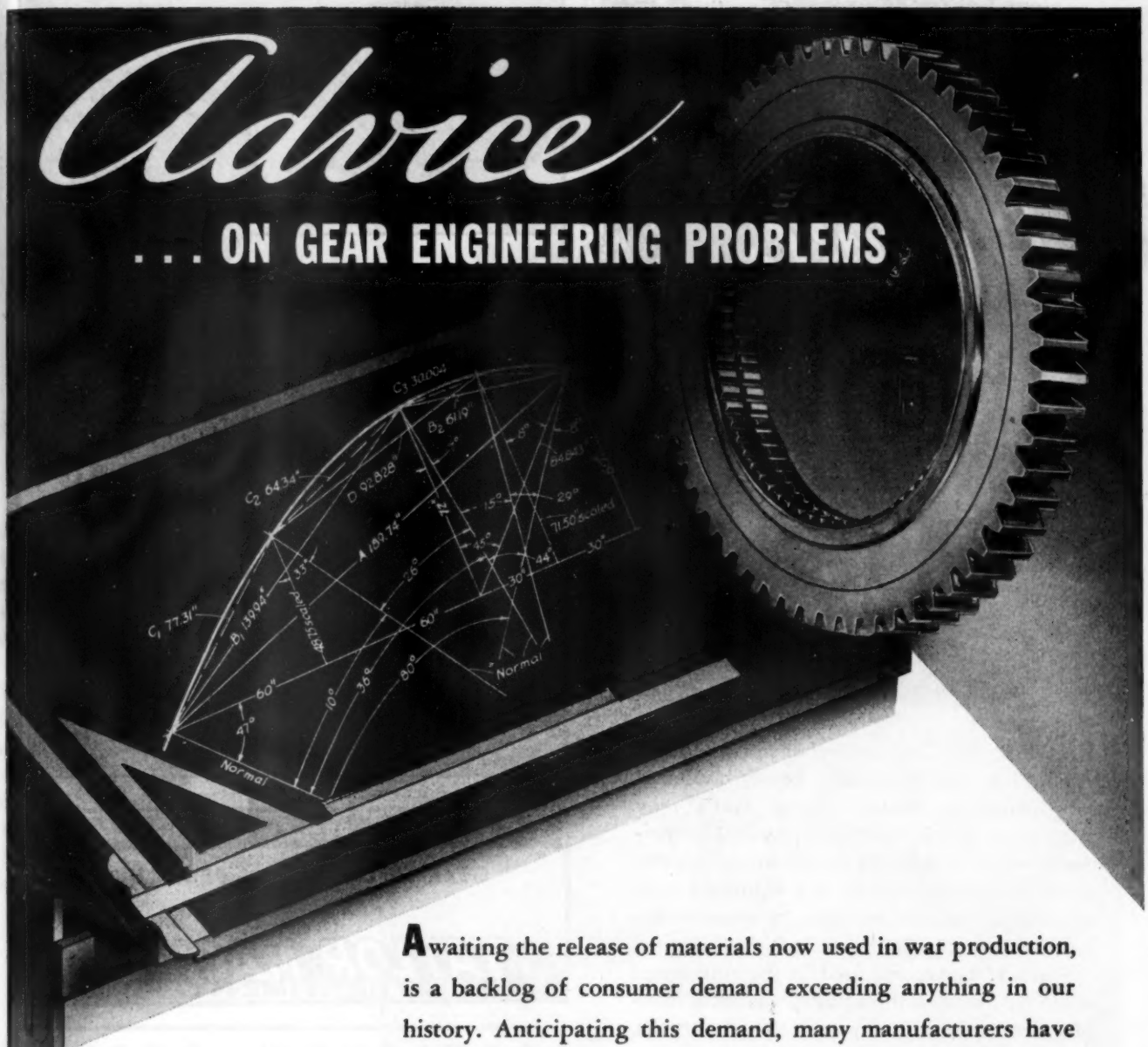
. . . ON GEAR ENGINEERING PROBLEMS



Awaiting the release of materials now used in war production, is a backlog of consumer demand exceeding anything in our history. Anticipating this demand, many manufacturers have already enlisted the services of this company on their gear engineering problems as applied to their new or improved post-war products. To such a service Perkins brings the kind of engineering "know-how" whose soundness has been fostered by many years of diversified experiences in the design, production and application of precision, custom-cut gears.

CONSULT PERKINS—it is not too early to do so now!

PERKINS MAKES:

Helical Gears — Bevel Gears — Ratchets
Worm Gears — Spiral Gears — Spur Gears
Ground Thread Worms

IN USE, gears are under unending test, a test which will invariably betray faults of construction or design. These faults may originate in the chemical and physical properties of metal. Fairfield's metallurgical department is expertly staffed and equipped with modern devices for analysis, to examine the metal thoroughly before and after processing.

Fairfield Gears are used in the equipment made by many of the country's leading manufacturers of tractors, power shovels, trucks, stokers, mining machinery, oil machinery pumps and other equipment.

It may pay you well to familiarize yourself with the advantages offered by Fairfield's gear making and engineering services.

GEARS MADE TO ORDER

SPIRAL BEVEL — HYPOID
STRAIGHT BEVEL — HELICAL
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FAIRFIELD MANUFACTURING CO.
307 S. Earl Avenue • Lafayette, Ind.

ARMY E NAVY

FAIRFIELD For FINE GEARS

TO HOLD GEARS
with precision for boring or grinding
HAVE TEETH GRIPPED ON LINE OF ACTION
Principle used only in

MATCH-IT GEAR CHUCKS

Method eliminates distortion. Gears have perfect, round holes. Made for internal and external gears, for spur and helical gears, and for countershaft type gears.

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THREAD GRINDING

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FOR SIXTY YEARS

Spur—SPEED REDUCERS—Worm
ALL TYPES OF CUT GEARS

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and the way MEISEL builds gears, there's just one *right* gear for any specific job. Designed for use under conditions that exist, MEISEL Gears actually "belong" to a machine . . . are inherently able to give longer, quieter, more economical service. Investigate the advantages of *specifically* engineered gears by MEISEL.

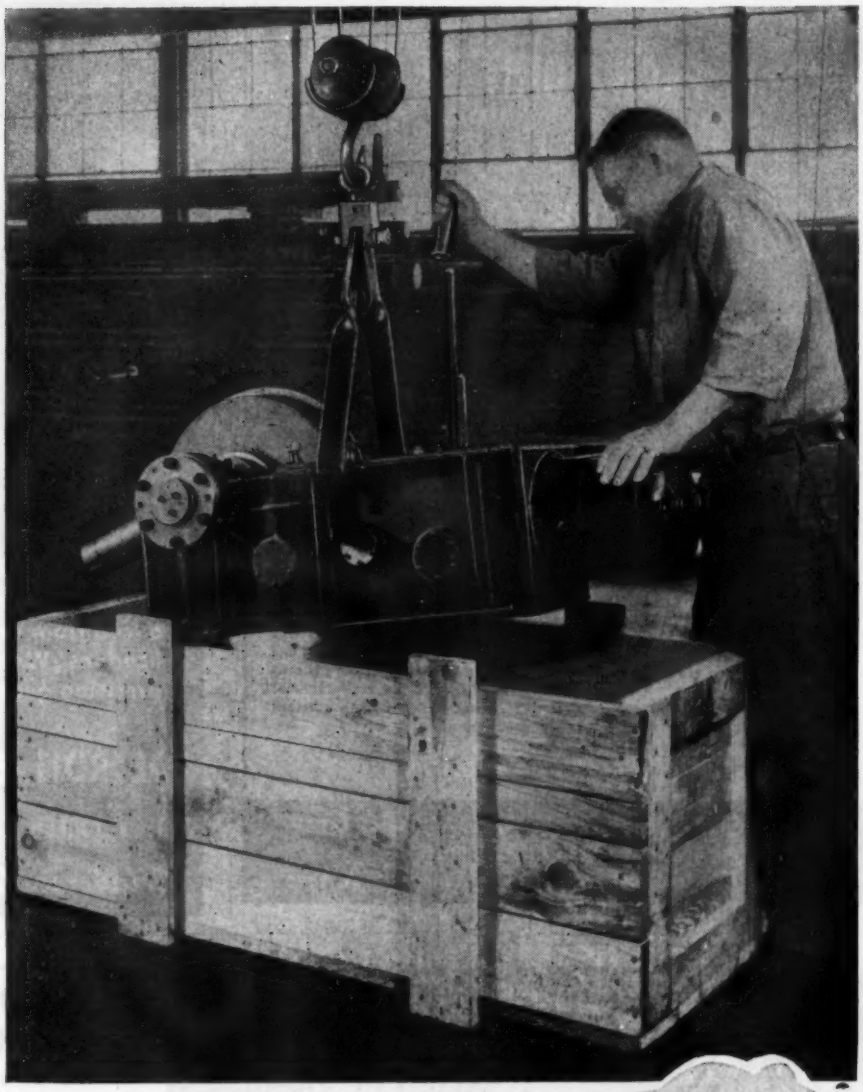
MEISEL PRESS MFG. CO.
946 Dorchester Ave. Boston, Mass.

READY TO GO!

PRECISION GEARS *make up a transmission unit . . . and . . .* SIER-BATH *makes both*

While precision gears are Sier-Bath's specialty, our facilities are such as to enable us to handle the manufacture of equipment which involves the use of gears.

This special power transmission device — one of many recently built by SIER-BATH—with gears playing an essential part in attaining a very high ratio of reduction. It is typical of the class of work produced by Sier-Bath.



We invite an opportunity to bid on your specifications for gears as well as for gear-driven equipment, with assurance that we are equipped to handle your requirements PROMPTLY.

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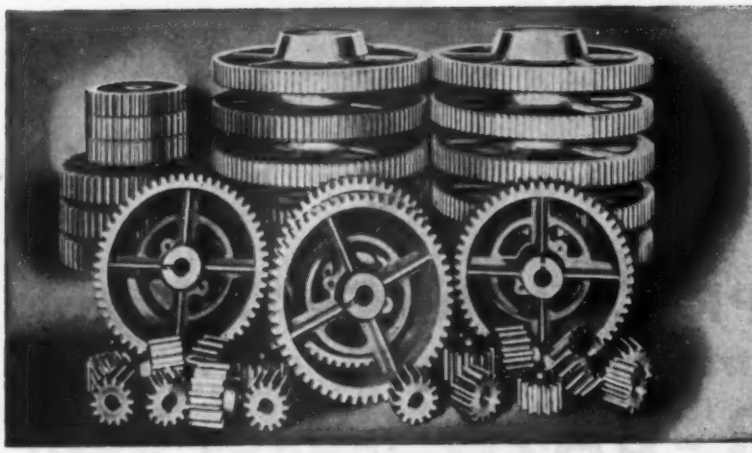
The Doorway to 38 years experience in making Precision Gears



ADAMS GEARS

SPUR — HELICAL — WORM
BEVEL — MITER — RACKS

Splined Shafts A Specialty

THE ADAMS COMPANY
Est. 1883
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FROM EACH POINT OF VIEW
Cincinnati Gears
HAVE MUCH TO OFFER

- ★ SPUR
- ★ BEVEL
- ★ HELICAL
- ★ SPLINE
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- ★ SPECIAL

THE DESIGN ENGINEER using Cincinnati Gears has all the advantages that permit wide flexibility of design coupled with proven accuracy, performance and dependability.

THE MANUFACTURER finds many production advantages in Cincinnati Gears. These *Gears —Good Gears Only*, because of their higher degree of uniformity assure the manufacturer of faster and more efficient production.

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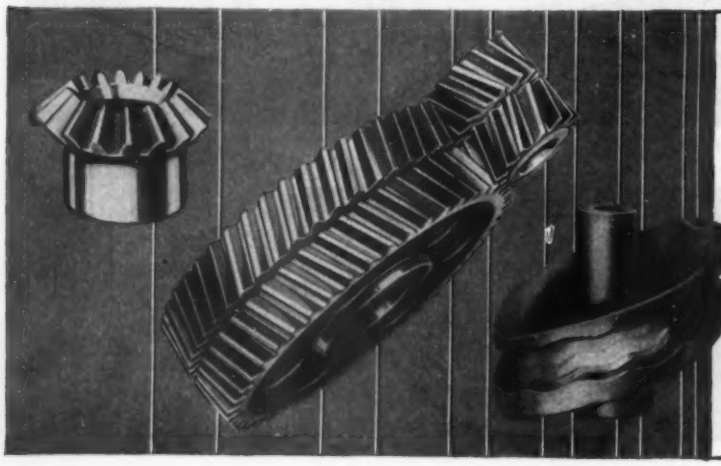

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Send blue prints or samples for estimate. Accuracy of work guaranteed to your specifications.

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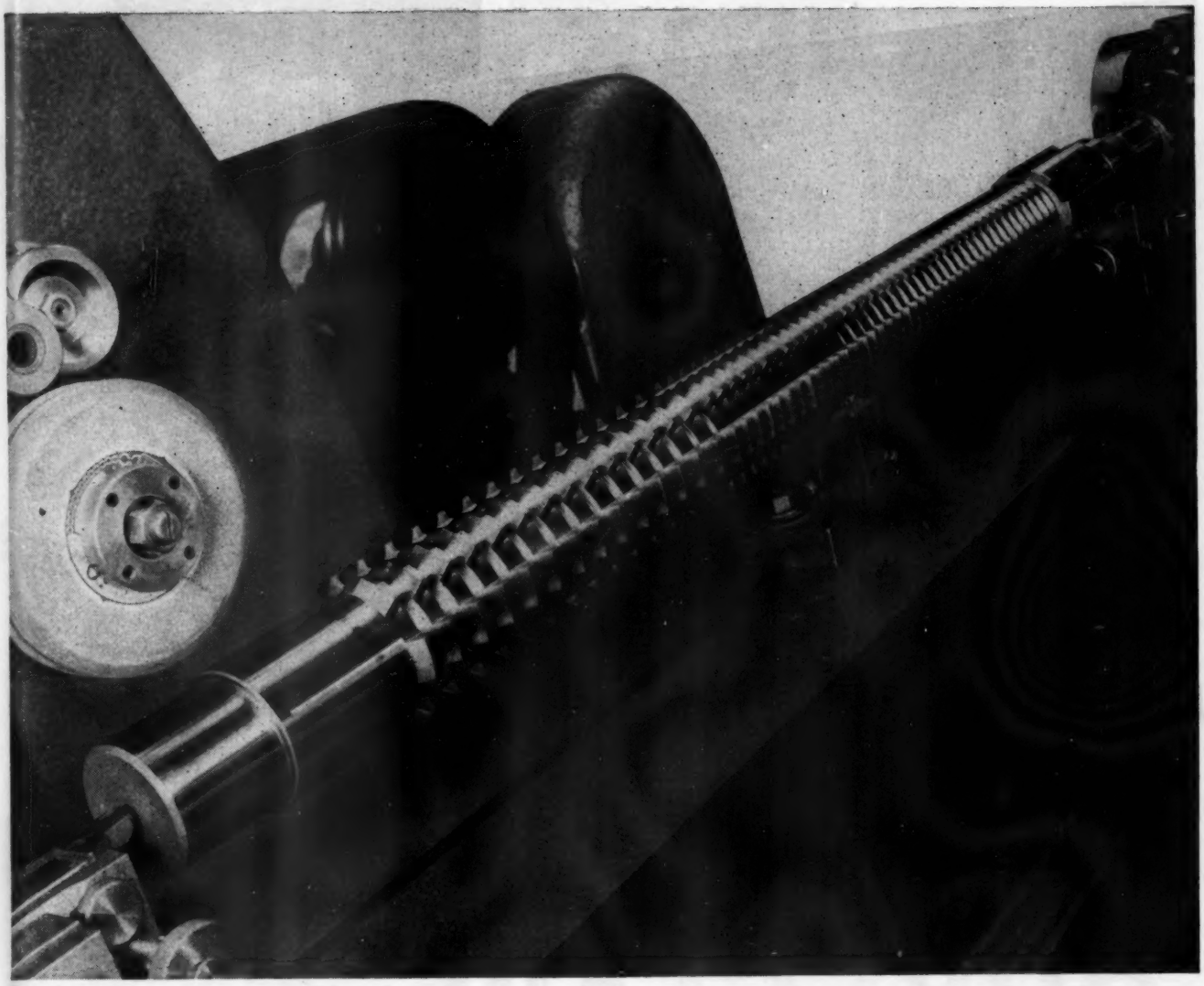

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For Fast, Economical Material Handling

TOWMOTORS DEPEND ON OHIO GEARS

In army and navy supply depots, in huge war plants as well as in peace-time factories and warehouses TOWMOTORS are busy at their quarter century job of saving time, space, manpower and money in handling materials.

Tough, war-time operation has served to emphasize their dependability—the dependability that is insured by the careful selection of every TOWMOTOR part.

Gears, as one instance, must withstand the shock, strain and wear of round-the-clock service under heavy loads. They must be precision-made for accuracy, tough for wear and long-lived for economy.

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Helping TOWMOTORS move more goods faster these war days is another way Ohio Gear men are helping bring Victory closer.

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OHIO GEARS

POWERED WITH THREE STERLING ADMIRAL ENGINES

A LIGHTNING blur as the slim, grey hull streaks in—a white trail of foam on an azure sea—a blinding flash —a thunderous roar—and it's "bottoms up" to another enemy ship.

Swift, powerful, deadly, despite their midget size, the mosquito fleet has struck terror to enemy shipping in every theatre of operation.

And the success of these small craft is due largely to the Sterling engines in their holds—engines so powerful that they have aptly been called "masterpieces of precision design."

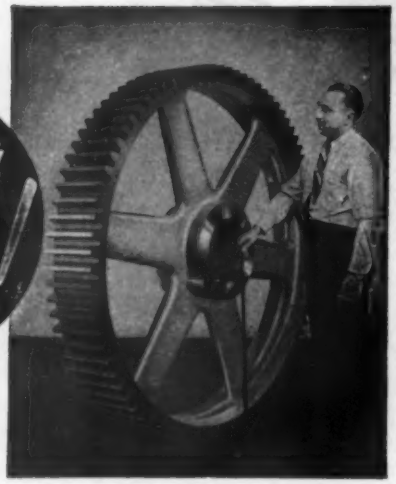
Compactness and precision are characteristic, too, of the Foote Bros. gears that aid these engines in delivering their power. For today, these high precision gears are being turned out on a production basis made possible by new manufacturing techniques—new production know hows.

When the war is won, such high precision Foote Bros. gears will offer American manufacturers new efficiencies in power transmission for machines of peace.

FOOTE BROS. GEAR AND MACHINE CORPORATION
5225 South Western Boulevard, Chicago 9, Ill.

FOOTE BROS.

Better Power Transmission Through Better Gears



What's a Gear!

. . . and WHAT A SERVICE BEHIND IT . . . . . .

This husky gear—produced by Stahl—typifies one class of work we are equipped to handle. We're equally well set up to produce small gears to any specifications and of any material in any quantity, because we are gear specialists.
All of which means that when you need gears you are invited to take advantage of Stahl's modern, efficient and complete production facilities. Prompt service and reasonable price can be depended on. Our quotation will interest you.

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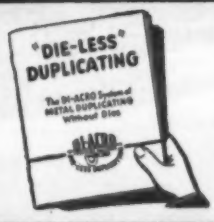
Send for Catalog "Die-Less Duplicating"
It illustrates many stampings or parts made without dies, gives full details on DI-ACRO machines and shows how they may readily be adapted for various applications. Request your copy now.



If you desire to save time and critical materials on production of metal stampings or other small parts, then the DI-ACRO System of "Metal Duplicating Without Dies" merits your consideration. It is based on the rapid and accurate production of formed parts with DI-ACRO Shears, Brakes and Benders. All duplicated work is accurate to .001". These precision machines are adaptable to an endless variety of work, and ideally suited for use by girl operators. For short runs your parts are processed in a matter of hours instead of waiting weeks for dies.

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● If you have a production phase that calls for tapering, sizing or reducing of solids or tubes, you can save money if you "ASK ETNA ABOUT SWAGING." The superior performance of ETNA machines assures you more pieces per hour at lower cost. Built in capacities of 1/8" to 4" . . . larger sizes built to order!

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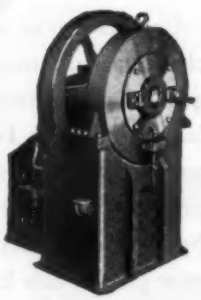

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TORRINGTON
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SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

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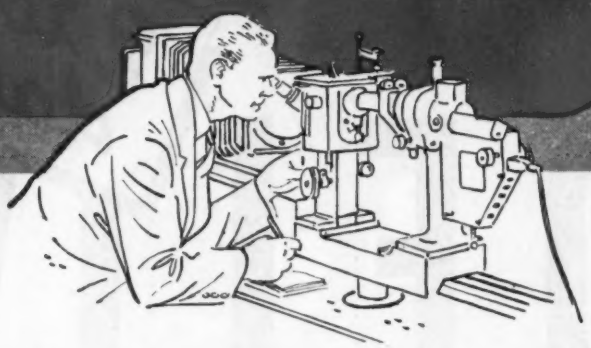

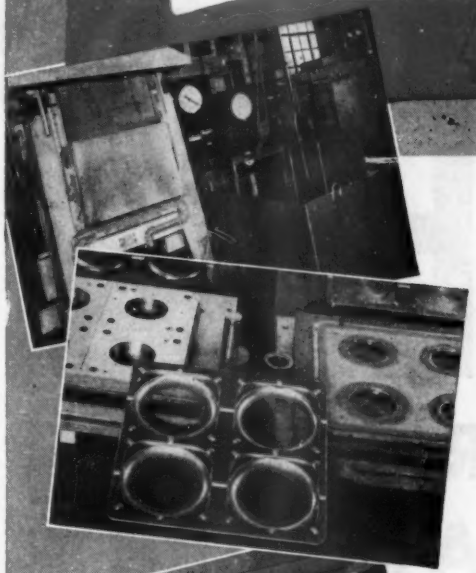

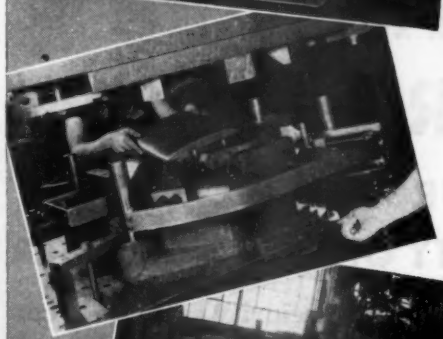

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An extensive series of laboratory tests were conducted to scientifically determine those die making materials which—

Provide Longest Tool Life
Eliminate "Galling" or "Pick-Up"

During these tests, varying heat treating procedures were observed, providing the information necessary to heat treat die materials to the peak of their effectiveness.

Extraordinary performances of hundreds of Advance Dies in the nation's War Production Program attest to the value of *exact knowledge.* A single instance in which Advance punches were used for drawing steel cartridge cases is typical.

The operation required punches of great strength, freedom from galling and resistance to abrasion. Advance punches consistently produced 300% to 400% more cases than any other punches tried.

Advance Die and Tool Company are using its design and manufacturing facilities in the war effort for the duration . . . but, when peace comes, plan to use Advance *exact knowledge* in building your sheet metal stamping tools and dies.

ADVANCE DIE & TOOL CO.

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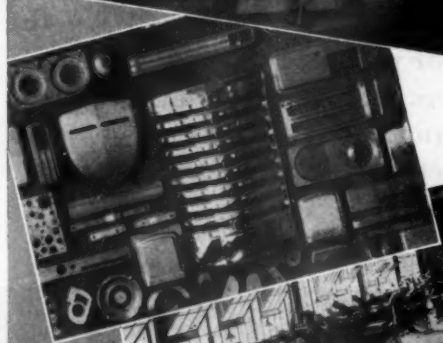

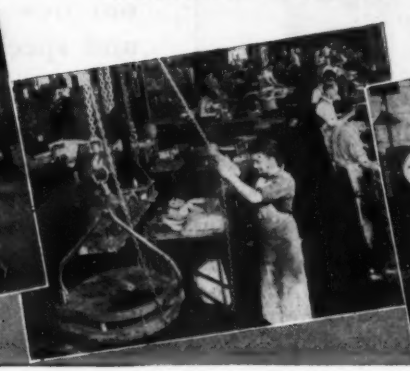

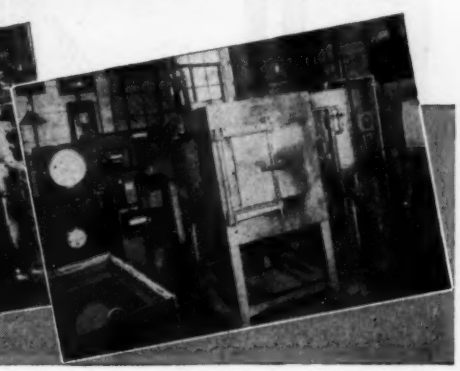

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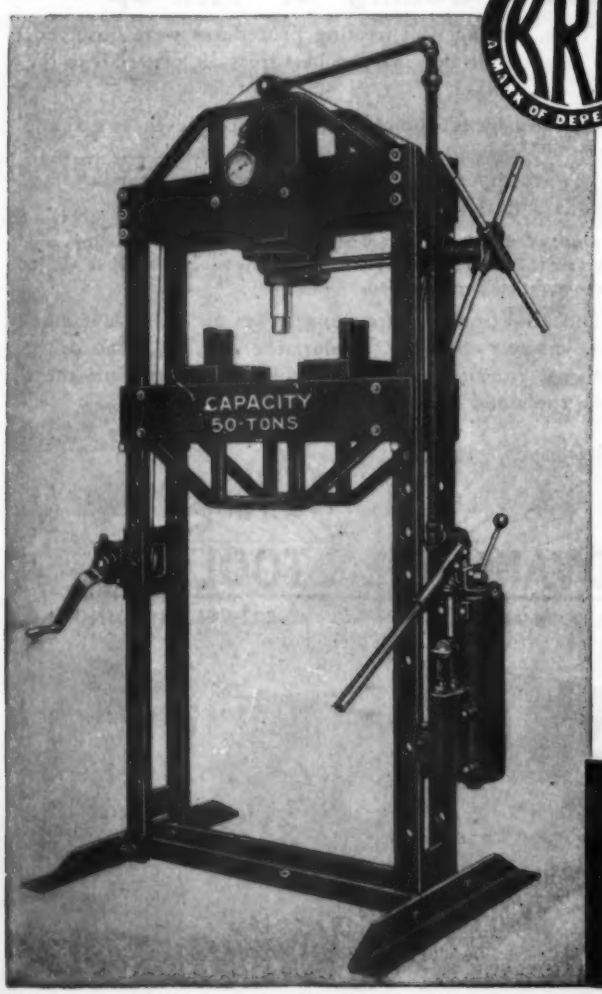

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IF YOUR ORDER CARRIES A PRIORITY OF AA-4 OR BETTER

● With the necessary Priority rating, we can make immediate delivery (2 to 3 days) on all standard model KRW Hydraulic Presses, and quick delivery (2 to 3 weeks) on special built-to-order hydraulic presses. KRW's modern plant and expanded facilities make this possible. If you want action, order a KRW—the hydraulic arbor press that is engineered for war production. Standard models are made in 25, 50, 60 and 75-ton capacities. Write for our new bulletin describing both standard and special presses.

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"SHIPYARD SPEED" ON ALL METAL FORMING JOBS

Standing 12 ft. high on floor space of approximately 7 ft. by 5½ ft., this 200-ton single action forming press has a pressing speed of 78 in. per min. with traverse speed of 700 in. per min. Bolster area is 48" x 36"; slide stroke 20"; shut height 16". Driven by 50 h.p. motor.

This W-S hydraulic press is doing an effective metal forming job in a Navy shipyard to speed production of parts and shapes so vital. In the same way that this press is helping to speed shipbuilding and repair, all W-S metal forming presses will produce fast-forming operations in many metal working plants.

Watson-Stillman Metal Forming Presses are made in single and double action types, with and without cushion cylinders. Where cushion cylinders are used they are arranged so that they can provide only a cushion and also obtain separate action if required.

Automatic, electrical single-cycle control equipment, with gauges, auxiliary valve, etc. are panel mounted. Write for complete specifications and details. The Watson-Stillman Co., Roselle, New Jersey.

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DESIGNERS AND MANUFACTURERS OF HYDRAULIC EQUIPMENT, VALVES, FORGED STEEL FITTINGS

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THEIR PRECISION
Means Greater Accuracy In Your Production
Danly Commercial Sets
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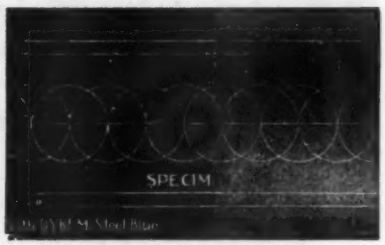
DYKEM STEEL BLUE
STOPS LOSSES
making dies & templates



simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.
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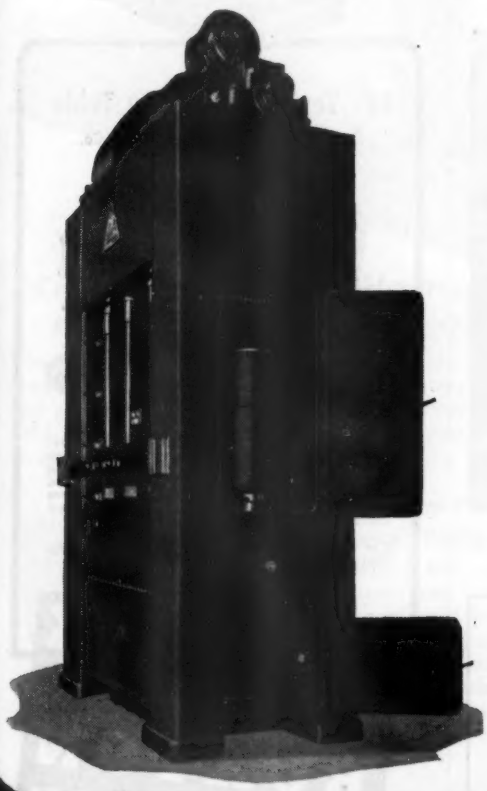
CLEARING CROWNLESS

The crownless, self-lubricating mechanical press illustrated here is another modern development in Clearing press design.

In this type of construction, an eccentric drive unit is housed in each of the two uprights of the press. All stress developed under ram pressure is absorbed entirely by the welded steel upright sections. The two eccentric drive units with steel herringbone gears provide symmetrical transmission of power to the slide at its extreme ends.

All parts of the press are built in. Eccentric drive assemblies, electric wiring, and air line piping are readily accessible by means of doors in the uprights.



Among the many design features of the Clearing crownless press are:

- Clearing oil bath system automatically lubricates all moving parts of the press. Gibs are automatically lubricated as well.
- Compact design saves floor space...no pit required ...installation can be made with minimum headroom.
- "Built-in" construction provides maximum safety for operators.
- The unusually deep slide is guided by extra long gibs which are precision machined to assure accuracy equal to the quality of the dies.

For complete information on this or any other type of mechanical or hydraulic press from 50 to 10,000 tons capacity, write Clearing today. Clearing Machine Corporation, 6499 West 65th Street, Chicago 38, Illinois.

CLEARING

CMC CLEARING

KALAMAZOO Metal Cutting BAND SAW

DRY MODEL—

Machine illustrated is suitable for intermittent cutting.

WET MODEL—

Coolant attachment can be supplied for above machine or machine can be purchased as a complete unit with coolant. Attachment does not interfere with convenience or portability and permits high speed, continuous, straight line cutting.

The Band Saw Principle is More Efficient as the Cutting Action is Continuous—

More Speed and Accuracy on Cut-Off Work at a **LOWER COST**

Thousands of progressive war plants have learned that the Kalamazoo band saw is far more efficient, convenient and accurate on most of their cut-off work than other methods. They have learned that this compact, low-cost machine can do most of the work heretofore handled on large, expensive machines.

This equipment has pointed the way to increased savings NOW and also on after-the-war production.

Two sizes—8" x 16" and 8" x 24". Cuts solids, tubes or odd shapes. Four speeds for cutting any metal. Portable and plugs into light circuit.

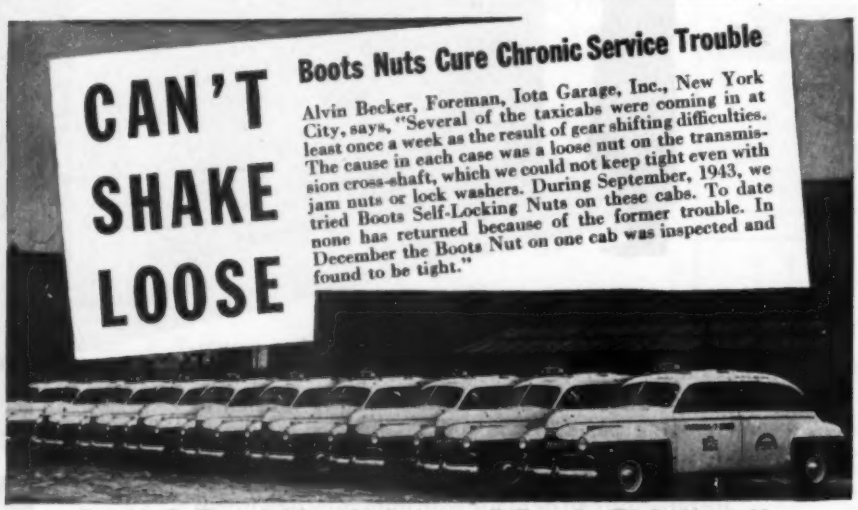
Write for Bulletin or Ask Your Dealer.

MACHINE TOOL DIVISION - - KALAMAZOO TANK & SILO CO.
KALAMAZOO, MICHIGAN

CAN'T SHAKE LOOSE

Boots Nuts Cure Chronic Service Trouble

Alvin Becker, Foreman, Iota Garage, Inc., New York City, says, "Several of the taxicabs were coming in at least once a week as the result of gear shifting difficulties. The cause in each case was a loose nut on the transmission cross-shaft, which we could not keep tight even with jam nuts or lock washers. During September, 1943, we tried Boots Self-Locking Nuts on these cabs. To date none has returned because of the former trouble. In December the Boots Nut on one cab was inspected and found to be tight."



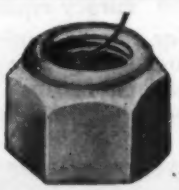
Part of the Sky-View taxicab fleet with bodies by James F. Waters, Inc. This fleet is serviced by IOTA GARAGE, INC., New York City. Boots Nuts were tested on cabs like these.

IN THIS modern repair shop, the Boots All-Metal Self-Locking Nut has demonstrated again how effectively it can eliminate the trouble, delay and expense so frequently caused by a loose nut. The Boots Nut *locks* itself tight—and it *stays* tight until you take it off for use again. It *can't* shake loose. Consequently, when peace makes the Boots Nut available, fleet operators will profit by new economies in maintenance, fewer interruptions in service and longer life in equipment. "There's no excuse for a nut shaking loose!"

BOOTS SELF-LOCKING NUTS
"There's No Excuse for a Nut Shaking Loose"

Boots Aircraft Nut Corp. • General Offices, New Canaan, Conn.

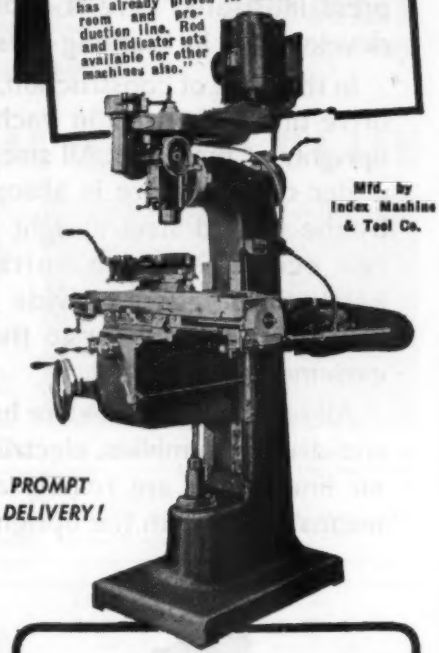
The ALL-METAL lock is built in here



ROL-TOP. This style nut now made for exclusive use on all types of aircraft engines. It is the nut referred to in the above text.

NOW! INDEX MILLS EQUIPPED WITH RODS & INDICATORS

"We are pleased to announce a rod and indicator set available for installation on Index Mills, either new at the factory, or used machines already in the field. Set consists of two indicators graduated in .0001" two micrometer heads graduated in .0001", necessary precision rods for locating in an area 8" x 16", and troughs for holding rods cross and longitudinal. This makes it possible for you to obtain, at an astonishingly low price, a precision locator as well as a vertical mill which has already proven its merits in the tool room and production line. Rod and indicator sets available for other machines also."



Mfd. by Index Machine & Tool Co.

PROMPT DELIVERY!

12" Tool Room Rotary Table

Mfd. by Index Machine & Tool Co.

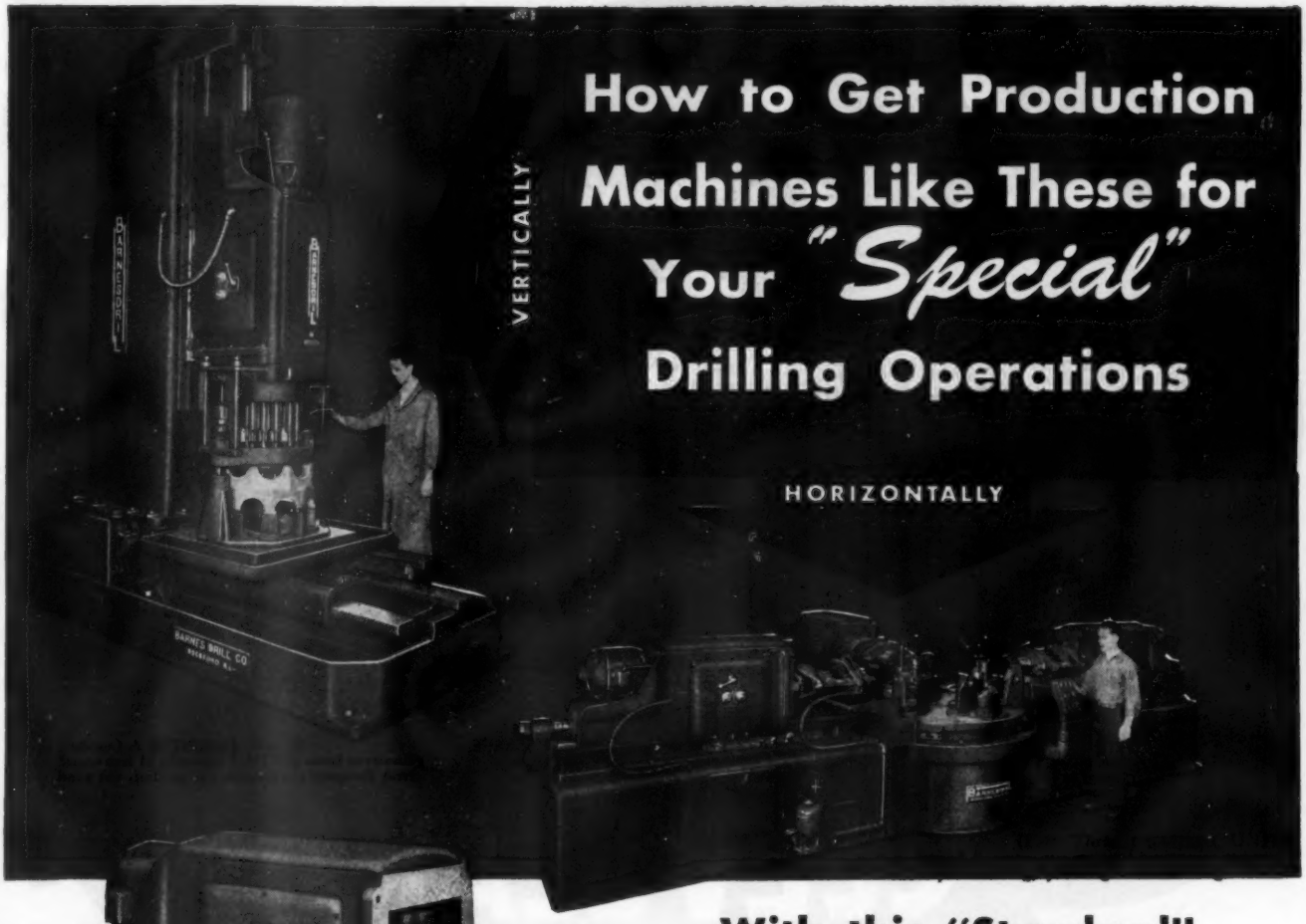
A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

For use on Index Mills or any other machine that will accommodate a 12" table.

BLANK and BUXTON MACHINERY

3100 E. MICHIGAN AVE.
JACKSON, MICH.

How to Get Production Machines Like These for Your "Special" Drilling Operations



(Above) BARNESDRIL Standard Hydraulic Production Drilling UNIT.

Can Be Arranged Vertically, Angularly, or Horizontally

These BARNESDRIL UNITS can be arranged in one, or any combination of vertical, horizontal or angular positions and an appreciable saving in machining and handling time is realized when the UNITS are grouped around an indexing table for progressive operations.

Get Complete Facts In This New Bulletin

Complete details and specifications of these new BARNESDRIL UNITS are contained in a new bulletin, available now upon request. The bulletin explains how these machines, when adapted to your work, result in greater production at lower cost. Send for Bulletin A-150 today.

With this "Standard" BARNESDRIL Hydraulic Drilling UNIT

It is now possible to obtain maximum production at lowest cost on your "special" drilling work with BARNESDRIL Standard Hydraulic Production Drilling UNITS. Self-contained and complete in themselves, these UNITS can be furnished as high production drilling machines, by mounting on the proper columns, horizontal beds, supports and other elements. Three sizes, Nos. 5, 10 and 20, are available, each motorized according to the requirements of the job. The flange support of the UNIT allows mounting of interchangeable auxiliary heads with the required number and arrangement of spindles. Considerable savings have been effected in engineering and development costs by the use of standard UNITS in the construction of these machines.

Barnes Drill Co. 830 CHESTNUT STREET ROCKFORD ILLINOIS, U.S.A.

There Are CLEVELANDS Big Enough

Remember— CLEVELANDS CUT COSTS!

. . . for really heavy full automatic work, like this Model A 10″ Cleveland. There are Clevelands small enough for high production on bar stock down to 9/16″—and a wide range of models for every size between. All of them save money because they *set up quickly* and produce rapidly, multiple operations often requiring two or more individually manned machines of other types. ● Also Cleveland-made high pressure hydraulic die-casting machines for magnesium, aluminum, brass, bronze, zinc, tin or lead. ● ***Ask for Cleveland bulletins on automatic or die-casting production equipment.***

SALES OFFICES

CHICAGO:
1408 Civic Opera Building

DETROIT:
540 New Center Building

NEWARK:
902 American Insurance Bldg.

CINCINNATI:
1315 American Building

THE CLEVELAND AUTOMATIC MACHINE CO.
CLEVELAND 3, OHIO

BEING PRODUCED AGAIN!

MODERN PUSHERS

. . . Imitated But Never Equalled

These Production Advantages Are Again Available To You

- ★ So designed that only one is required for round and hexagon stock and only one for round and square stock.
- ★ A long, flat surface grip.
- ★ Can be tightened, when they come loose through wear, to any desired tension without the aid of special tools.
- ★ Oversize material can be run with Modern Pushers that take the same list prices as other types of standard pushers.
- ★ Unusually long wearing . . . made of special analysis steel.
- ★ Make possible less "bounce-back" and short pieces.

In 1922, Modern Collet originated the design of feed finger typified in the standard Modern Pusher of recent years. As experience was gained and improvements were made in the manufacture of this type of product, Modern Pushers rose rapidly in their acceptance throughout the country. Last year, more Modern Pushers were used than all other feed fingers combined. As a result, when fire destroyed the Modern Collet plant and production of these pushers was halted, their unavailability was seriously felt.

In resuming manufacturing operations, these pushers and standard collets were the first items to be put back into production. A substantial production volume has now been reached and this will be increased as new plant facilities are completed.

Standard Modern Pushers are available again—produced by the same company that has had more than two decades of experience in the manufacture of this one type of feed finger. For full information on present deliveries call your Modern Collet sales representative or write directly to the plant.

BUY MORE THAN BEFORE IN THE FIFTH WAR LOAN

MODERN COLLET and MACHINE CO.

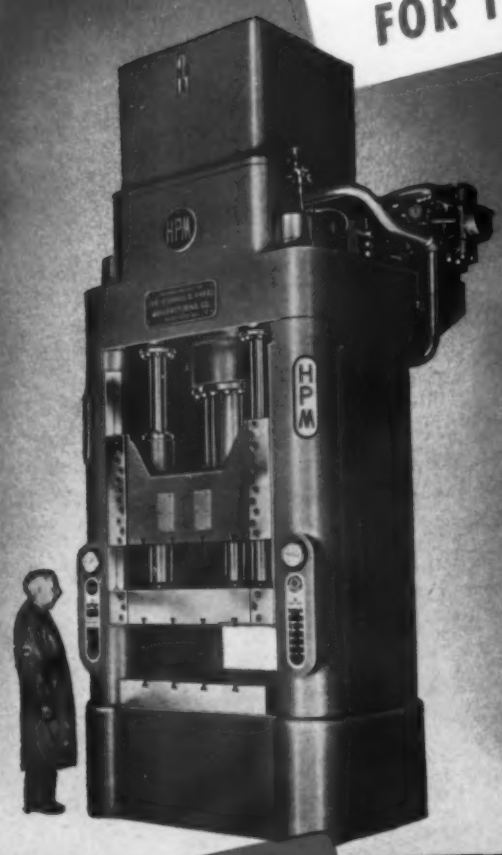
401 SALLIOTTE STREET • ECORSE, MICHIGAN

H-P-M FASTRAVERSE P

. . . Automatic, High-Speed Production Eq

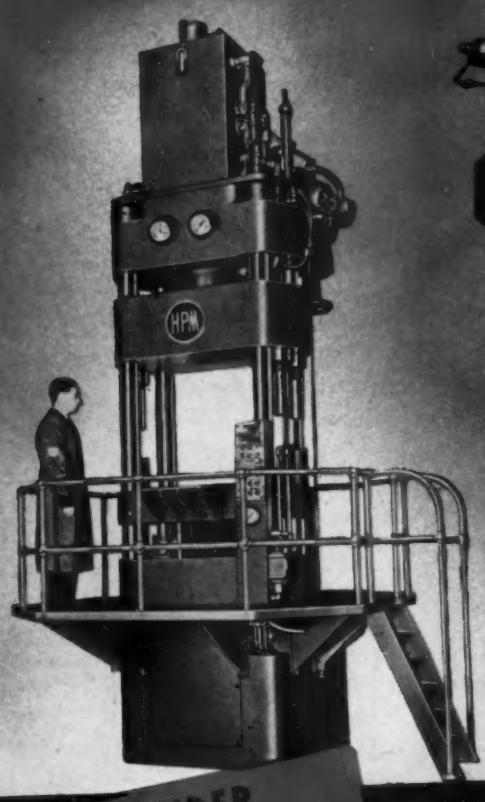
For REDUCING METAL WORKING CO

FASTER SPEEDS FOR 194X PRODUCTION



SHEET METAL FORMING

Imagine drawing sheet metal parts 26 inches deep at the rate of 5 parts per minute. Such is typical of the work of modern H-P-M FASTRAVERSE presses. They have rapid two stage action with closing and opening movements at the rate of 1200 to 2100 inches per minute. Full tonnage drawing speed is at the rate of 330 inches per minute or more for the entire length of draw. Faster deep drawing this modern "All-Hydraulic" way means more production and lower costs.



POWDER METALLURGY

Production of metal parts is speeded up by this process through elimination of machining operations, as the parts are pressed from powdered metal to the exact final form. No subsequent finishing is required. Savings are outstanding where parts are intricate. This result is accomplished with H-P-M presses especially designed for the work. They are "All-Hydraulic" machines, of straight forward design. Automatic control of each function is available.

E PRESSES
onEquipment
NGCOSTS!!

FASTER SPEEDS
FOR 194X PRODUCTION

With higher labor costs, it is requisite that postwar metal products be produced faster per man hour than they were in 1941. The answer to this problem is fewer rejects and faster production. H-P-M FASTRAVERSE presses are well known for their efficiency and fast operating cycle. They are rapidly replacing slower hydraulic presses, and less efficient mechanically operated machinery. Have you investigated the latest type of H-P-M FASTRAVERSE press for the pressure processing of metals? Regardless of your metal working problem, whether it be sheet metal working, forging, die casting or powder metallurgy, there is an H-P-M press that will do the job cheaper, faster and better. In many cases, first costs are no more than any other types of equipment.

Consider doing that metal working job hydraulically. Ask yourself this question—What type of press equipment will my competitors be using in 194X ?

THE HYDRAULIC PRESS MFG. CO.
Mount Gilead, Ohio, U. S. A.

District Sales Offices: New York, Syracuse, Detroit and Chicago. Representatives in Principal Cities.

FORGING

It is evident that speed is of primary importance in forging hot metals. The powerful squeeze of the high speed hydraulic press has revolutionized forging practice. Proper metal flow and advantageous grain structure are direct results. The H-P-M FASTRAVERSE press is pioneering a new press forging era. High speed action, free from the sharp die impact of mechanically applied force, has made the self contained H-P-M press the answer to modern forging problems.

DIE CASTING

High pressure die casting of magnesium has necessitated the use of die casting machines with very fast injection speeds. Plunger speeds up to 7200 inches per minute are furnished as standard. Plunger movement at this speed cannot be seen by the human eye. Alloys of aluminum, copper and zinc are also cast with this universal H-P-M "All-Hydraulic" die casting machine. The high speed, straight-line hydraulic mold clamp provides many additional time saving features.

NEW . . . SUPERIOR . . . EXCLUSIVE . . .

Hammond SAFETY FEATURE!

AN INNOVATION . . . PROVIDES COMPLETE PROTECTION WHILE GRINDING

The new safety cup disc, now standard equipment on all Hammond cup wheel grinders, is the greatest safety unit ever installed on any carbide tool grinder. It prevents the operator getting fingers, or dropping tools, into cup of cup wheel. As an integral part of Hammond's cup wheel hood design, adjustment is provided for wheel wear. Before you buy a carbide tool grinder . . . investigate . . . compare! Hammond's complete line, from chip breakers to 20" grinders, gives you complete facilities for carbide tool maintenance.

All Hammond Carbide Grinders provide greater operator freedom and visibility of the work with complete safety while grinding. 14" wet grinder shown has cup wheels both ends.

WRITE FOR COMPLETE BULLETIN

Hammond Chip Breaker Grinders for 4" or 6" wheels, also Heavy Duty Type

Hammond 10" Wet-or-Dri Carbide Tool Grinder Model D-10 Shown

Hammond 6" Carbide Grinder for Finish Grinding

Hammond Machinery Builders INC.

KALAMAZOO 54F, MICHIGAN

1618 DOUGLAS AVENUE

Eastern Branch—71 West 23rd St., New York 10, N. Y.

ARE YOU

GETTING COMPARABLE SPEEDS ON LARGE SCALE MAINTENANCE THREADING?

IF NOT

GET AN OSTER

"WILCO"

OSTER "WILCO" PIPE THREADING SPEEDS!

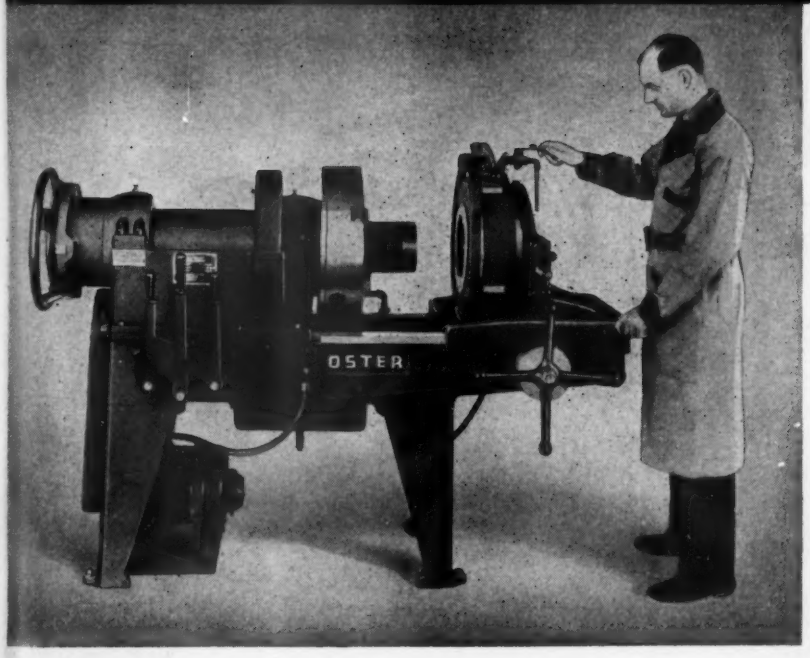
No. 704 "WILCO"

Pipe Size	*Threading Time*
1"	16 seconds
1¼"	16 seconds
1½"	24 seconds
2"	25 seconds
2½"	38 seconds
3"	40 seconds
3½"	56 seconds
4"	58 seconds

No. 706 "WILCO"

Pipe Size	*Threading Time*
1½"	19 seconds
2"	20 seconds
2½"	30 seconds
3"	31 seconds
3½"	48 seconds
4"	49 seconds
5"	70 seconds
6"	74 seconds

Note: Above time studies based on cutting full American National Standard pipe threads at recommended speeds.



Speed with accuracy equals low cost with safety! That's what the Oster "WILCO" Threading Machine is designed to do for YOU on YOUR maintenance threading of pipe and bolts.

The "WILCO" Die-Head handles ALL sizes within range of each machine and one set of chasers threads all sizes of the same pitch without change. Movement of cam lever sets chasers to any size.

Chasers are *high speed steel* . . . small, economical, segmental type . . . held in massive steel holders for rigidity. One or more chasers replaceable without renewing entire set.

Other important features are illustrated and explained in CATALOG 10-A. *Write for a copy.*

OSTER *for faster, better threading*

THE OSTER MANUFACTURING COMPANY, 2049 EAST 61st ST., CLEVELAND 3, OHIO, U. S. A.

A ONE MACHINE TOOLROOM WITH GUARANTEED PRECISION

RIVETT

The Rivett No. 608 is a super-precision, back-geared screw-cutting bench lathe designed for fine manufacturing, repair and experimental work. In tool-making and instrument shops it will handle a great variety of parts within the closest precision limits.

Finely made attachments for milling, spiral cutting, slotting, relieving, taper turning, ball turning, grinding, forming and multiple operations enable the user of a fully equipped No. 608 to finish his work completely without recourse to other machines. and throughout his entire series of operations to utilize the inherent precision of the lathe itself.

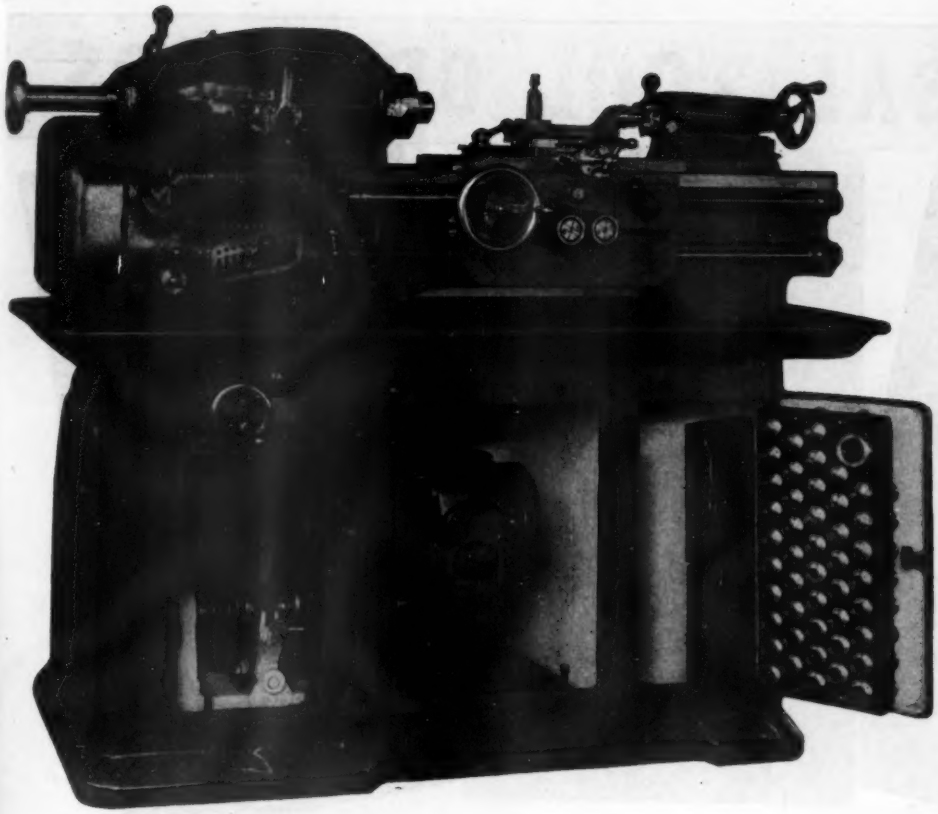
Write for Bulletin 608

Guarantee

The Rivett 608 will turn or bore within 0.0001" in six inches — work held in collet, and turn between centers within 0.0001" in six inches. The Rivett 608 will face to eight inches diameter within limit of 0.0002" concave, 0.0000" convex. The Rivett 608 will cut threads within 0.0005" in twelve inches, or within 0.0003" in any three inches, or within 0.0002" in any inch of a specimen piece.

RIVETT LATHE & GRINDER INC.

BRIGHTON, BOSTON, MASS., U.S.A.

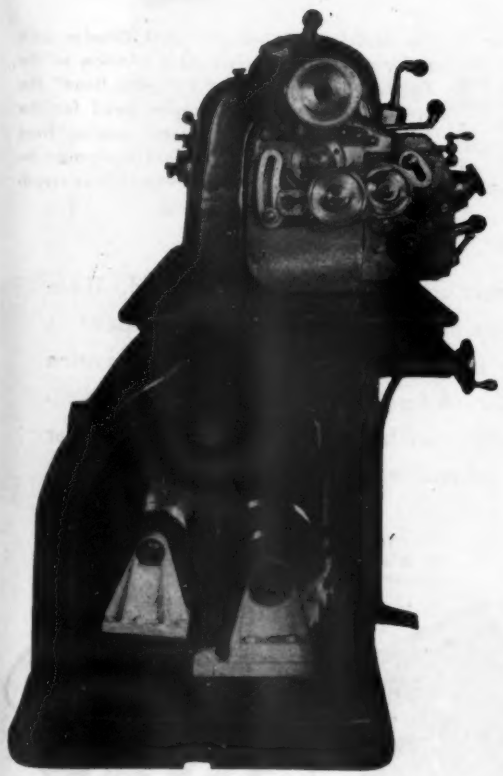


HENDEY

TOOL AND GAGE MAKERS' LATHE

This is a high speed sensitive precision lathe, made to meet the demands for a lathe heavier and of greater adaptability than the standard bench lathe. It has a working range of spindle speeds of 40 to 2000 RPM., and it is important to note that ANY AND ALL SPINDLE SPEEDS ARE OBTAINABLE in this range.

The quick change gear box gives 66 changes of threads and a like number of feeds for either belt or gear drive. On the index plate the 66 threads range from 2 to 120 per inch without duplication. Both the thread and feed ranges are incorporated in the quick change gear feature without any gear change required.

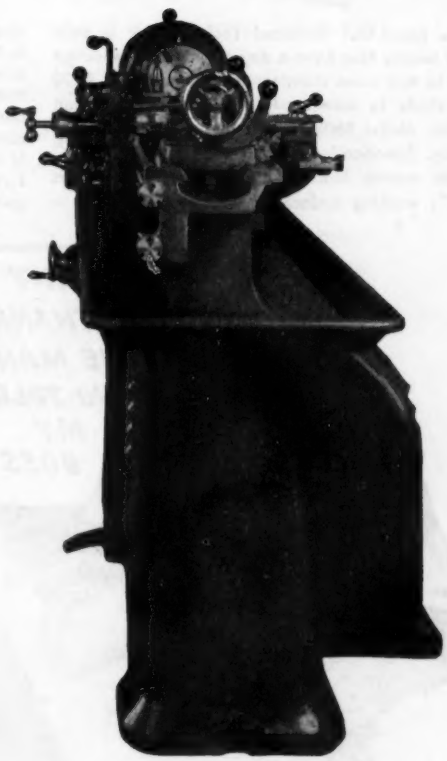


PRINCIPAL DIMENSIONS

Swing over ways	10¼"
Swing over cross slide	5½"
Center distance, nominal	18"
Range of spindle speeds,	40-2000RPM
Spindle Nose Cam Lock	DI-4
Hole through spindle	1½"
Maximum capacity of spring collets	1⅛"
Cross slide travel	5⅜"
Compound rest slide travel	2¾"
Size of tool	¾" x ⅜"
Approx. net weight of lathe complete with power unit	2480 lbs.

REGULAR EQUIPMENT

Large slotted face plate
Driving Plate
Micrometer carriage stop
Center rest
High speed centers
Thread chasing dial
Variable speed power unit
Chip pan
Necessary wrenches



THE HENDEY MACHINE COMPANY

TORRINGTON, CONN.

Branch offices, See Ad of Sept. 2, 1943.

UNIVERSAL TOOL GRINDERS

The *Knock-Out* Universal Tool Grinder is built for twenty four hour a day service on production or in tool room maintenance work. Model B600 is made to accommodate wet or dry grinding jobs. Model B602 is built for dry grinding jobs only. Specifications: Swing over table 6¼" (8¼" with raising blocks); distance between centers 17"; working surface of table 2⅜" x 22½".

Model B604 Universal Carbide Tool Grinder is built for fast and accurate grinding of conventional single point carbide tipped tools. This machine can be purchased complete to accommodate all grinding necessary on carbide tools, or as a Chip Breaker Grinder only (Model B603). It is equipped with the Universal Work Holding Fixture which can be readily re-set for repeat grinding of chip breakers.

The Model B660 Universal Tool Grinder with multiple speed head is a new addition to the *Knock-Out* family. With the "Speed Head" the operator can select the proper speed for the job. Nine speeds are available ranging from 1,000 to 11,000 RPM. Standard equipment includes nine assorted grinding wheels, four assorted pulleys, and four drive belts.

Knock-Out Grinders are truly leaders in their field. These machines offer the operator versatility of operation, speed in making set-ups, and economical grinding on both production and maintenance work. A large number of fixtures are available, any one of which can be applied to any K-O grinder without alteration to the machine.

Write for bulletins 27-64. Specify the grinder you wish to have more information about.

K. O. LEE COMPANY

ABERDEEN SOUTH DAKOTA

Use RED RING Lapping for Gear Teeth

When gear tooth surfaces have to be lapped, either to meet specifications or to correct heat treat distortion, the Red Ring Rotary Crossed Axes Method is preferred because of its unusual speed, accuracy and economy.

The Red Ring lap tooth surfaces slide over the work gear teeth in two directions simultaneously—a true lapping action. Furthermore, the pressure exerted on the work gear teeth is the same below the pitch line as it is above. This produces uniformly lapped tooth surfaces.

Spur, helical, shoulder and cluster gears with high, low, or ELLIPTOID tooth forms may be lapped on this machine. The machine is fully automatic and adjustable. If desired, the automatic cycle may be set to remove more stock from the drive face of the teeth than from the opposite face. Skilled operators are not required.

WRITE
FOR DESCRIPTIVE BULLETIN

NATIONAL BROACH AND MACHINE CO.

RED RING PRODUCTS

5600 ST. JEAN DETROIT 13, MICH.

Specialists on Spur and Helical Involute Gear Practice
Originators of Rotary Shaving and Elliptoid Tooth Forms

3 *important* books on TOOL DESIGN

written for you by an expert

Tool designers will tell you that any book on tool engineering by C. W. Hinman is a **MUST**

Send for them on approval

DIE ENGINEERING LAYOUTS AND FORMULAS

A practical toolroom engineer brings you in this new book the gist of his *40 years' experience* in interchangeable manufacture. Here are drawings and photographs with detailed explanatory text of 90 percent of all the key designs used in tools for presswork. Includes all the necessary mathematical formulas for laying out the assembled dies in a clearly rendered drafting technique — shows dies for producing war equipment that reveal basic principles of many key designs that will have wide application in fabricating an endless variety of small precision parts after the war—shows you the drafting shortcuts that war production has worked out. *497 pages, 311 illustrations, $5.00.*

PRESSWORKING OF METALS

A valuable reference for the design of press tools and the fabrication of metals in power presses—a reliable source for everyday use on bench, desk or drawing board. Gives numbers of basic designs, each of which embodies the means of simplifying presswork, improving results, saving material, cutting costs, or accomplishing difficult operations. From them toolmakers and designers can get endless ideas for solving specific problems of their own. *443 pages, 423 illustrations, $4.00.*

PRACTICAL DESIGNS FOR DRILLING AND MILLING TOOLS

A practical manual on computing, drafting, and designing of drilling jigs, gages, hand tools, tapping and milling fixtures. Features a clear presentation of principles of design, shown by the unusual method of illustrating them in typical designs for jigs, fixtures, attachments, and accessories useful in drilling, milling, and tapping practice, and then giving concise discussion of the important elements and utility of these designs. In this way the reader will get a review of 90 percent of the principles involved in the design of these tools—principles that can be applied in an infinite number of designing problems. Numerous suggestions on drafting, formulas and mathematical helps for the draftsman, etc., are given. *171 pages, 184 illustrations, $2.50.*

***All 3 books by* C. W. HINMAN**

Former Chief of Jig and Fixture Design, Western Electric Co., Chicago; former Chief Tool Engineer, Automatic Electric Company, Chicago.

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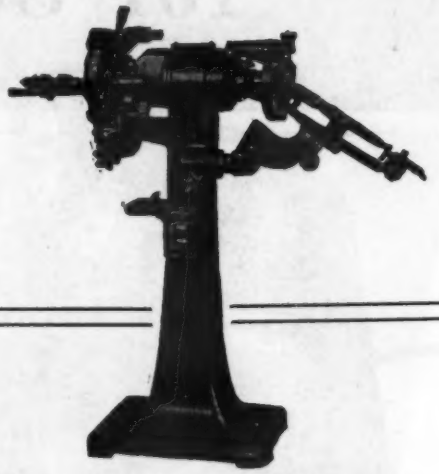
Grand Rapids



COMBINATION DRILL AND TAP GRINDERS

Model 10-B

Sharpens Taps, 2, 3 and 4 Flute, Right or Left Hand. Sizes No. 6 to one and one half inches.

Sharpens Drills, 2 and 3 Flute, Straight or Taper Shank. Sizes from one eighth to one and one half inches.

"Sharp Drills and Taps Cut Holes in Rising Production Costs."

Other Combinations Also Available

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Write for complete descriptive literature

GALLMEYER & LIVINGSTON CO.
300 Straight Ave. S.W.
GRAND RAPIDS MICH.

37% FASTER and CHEAPER ...this modern way!

Take any cutting or surfacing job you are doing the ordinary way and let our engineers analyze it. Start with simpler, easily sharpened tools; quicker work setups; then add faster cutting strokes; plus, multiple cuttings simultaneously—with fully automatic control—and the cost reductions will amaze you. Most typical cases in our files average a saving of 37% or better. Such savings are especially important in view of tomorrow's price competition—and indicate how costs can be cut with modern Liberty equipment.

AN ALL-PURPOSE UNIT FOR WORK OF VARIABLE WIDTHS. FOR *EXTRA WIDE* CASTINGS AN OUTBOARD WORK SUPPORT RAIL CAN BE USED.

FOR FAST PRODUCTION

- Motorized automatic rail clamping
- Dual push-button control for rapid traverse, elevation, clamping
- Automatic tool lifters
- Forced feed lubrication
- Stationary screws, revolving nuts
- Cutting speeds 4 ft. to 133 ft. per min.
- Electro-mechanical feed

To assist you in getting all the benefits of modern planer science and practice, Liberty offers the helpful cooperation of its trained engineers. With a background of thorough experience with all types of machine tool equipment and operations, Liberty Engineers can help you get greater production faster, more accurately, automatically—at lower cost.

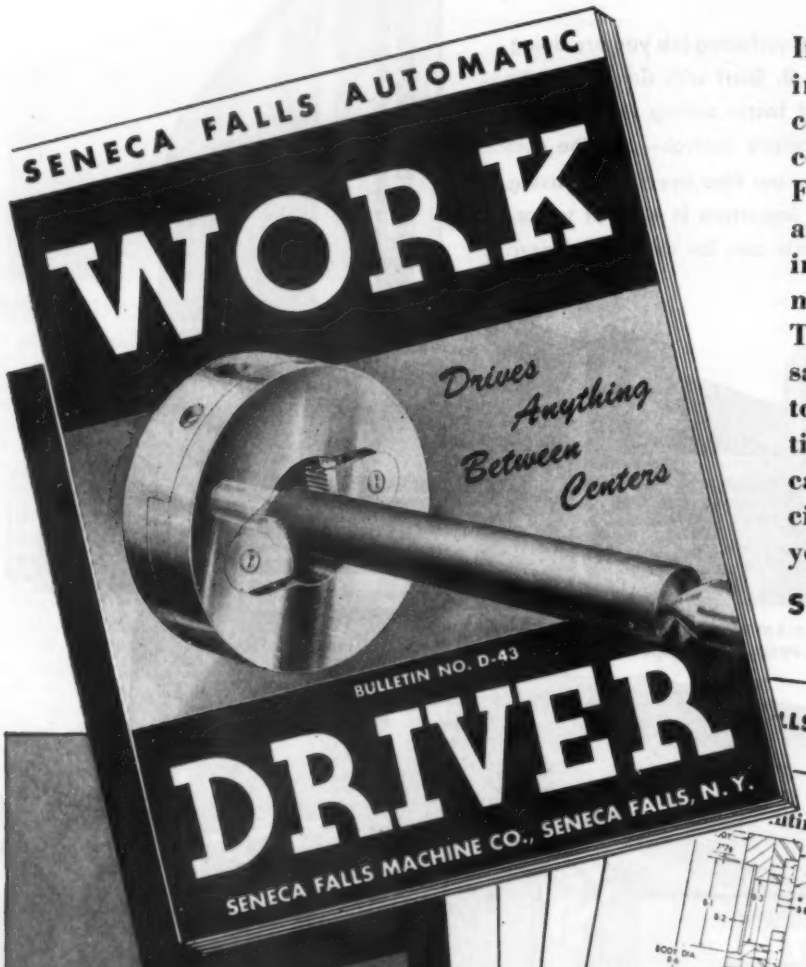
LIBERTY OPEN SIDE PLANERS

Ask for Bulletin 152, no obligation.

LIBERTY PLANERS • HAMILTON, OHIO • U. S. A.

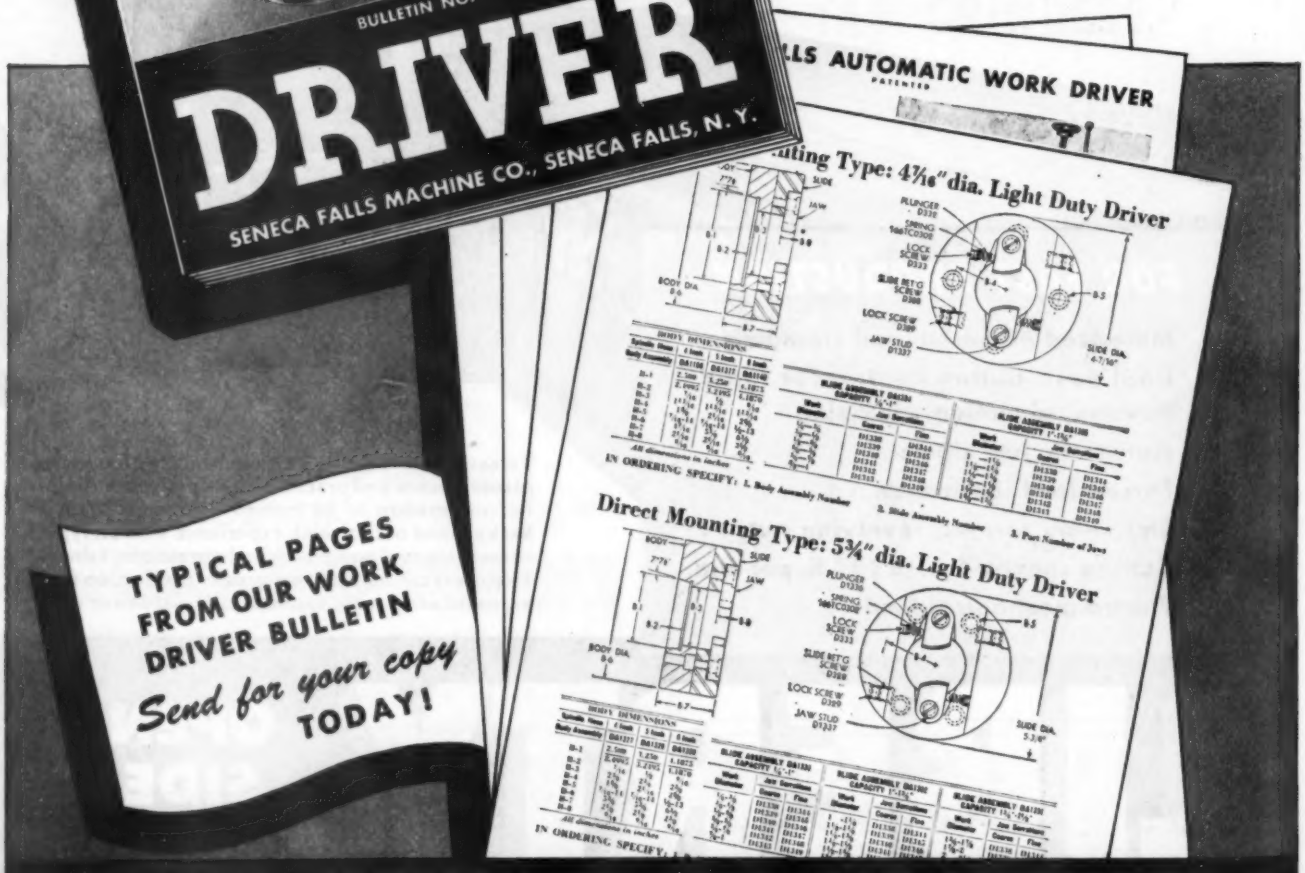
Over a Quarter Century of Specialized Experience with Time-Tested Principles of Design

This catalog will help you
SPEED UP BETWEEN-CENTERS WORK



If your manufacturing operations involve turning work between centers, write for your copy of this comprehensive catalog of Seneca Falls Work Drivers. It illustrates and provides complete engineering data on eighteen *standardized* models now available from stock. These proven time and labor-savers no longer need be made to individual customer's specifications. You will find a standard unit cataloged that will meet your specific requirements and help speed your war production.

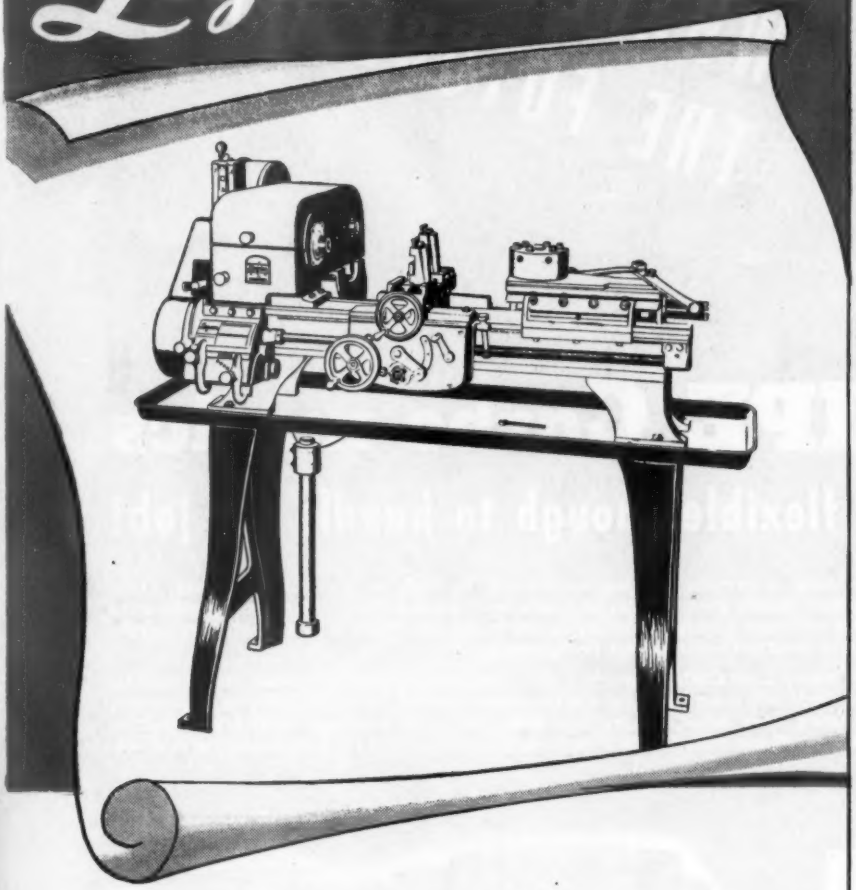
SENECA FALLS MACHINE CO.
Seneca Falls, N. Y.



TYPICAL PAGES FROM OUR WORK DRIVER BULLETIN
Send for your copy **TODAY!**

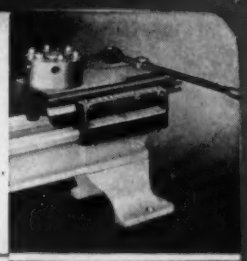
LATHE NEWS *from* SENECA FALLS

Logan ACCESSORIES widen THE USE OF Logan LATHES

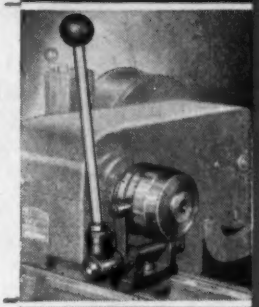


The tooling of Logan Lathes is just as important in obtaining maximum results as having an efficient machine. Logan Accessories are specially constructed with many patented improvements. They are built to the same standards maintained in manufacturing Logan Lathes. When used with Logan Lathes, accuracy is maintained, costs are lowered and output is increased. The various chucking accessories shown here are typical of a wide variety of other accessories that are available. To assure maximum efficiency from a Logan Lathe, ask your dealer or write for the latest Accessory Catalog.

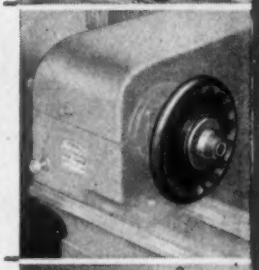
LA 40-51 TURRET ASSEMBLY
Six position, self-indexing. Fits bed of any Logan Lathe.



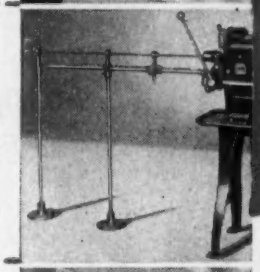
No. AC 218 PRODUCTION COLLET ATTACHMENT
Quick acting, lever type collet closer operates while lathe spindle is in motion. For Push type collets up to 5/8"



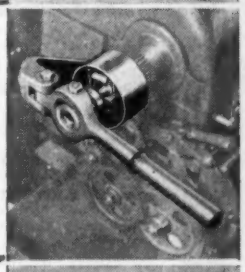
No. AC 281 SPEED COLLET CHUCK
Fits any lathe with 1½" x 8 thread spindle nose. Minimum overhang assures accuracy. For Push type collets up to 5/8".



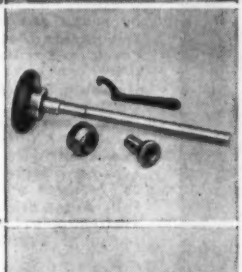
LA 32-34 BAR FEED
For Logan Hand Screw Machines. Uses Push type collets up to 5/8" capacity.



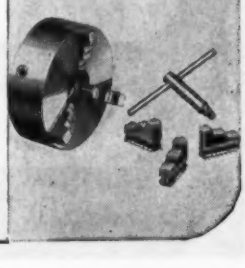
No. AC 165 and AC 166 PRODUCTION COLLET ATTACHMENT
Quickly attached to Logan Lathes. Operates while spindle is in motion. For Draw-in Collets up to ½" capacity.



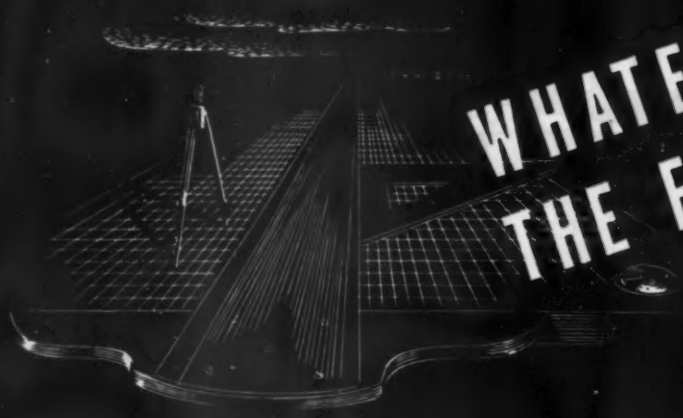
No. AC 150 and AC 151 DRAW-IN COLLET CHUCK ATTACHMENT
Accurately chucks work between 1/16" and ½" capacity.



No. 439 3-JAW, 5-INCH UNIVERSAL CHUCK
also
No. 444 6-INCH INDEPENDENT CHUCK
Need no separate back plates. For 1½" x 8 thread spindles.



LOGAN ENGINEERING CO.
CHICAGO 30, ILLINOIS
A Name To Remember When You Think of Lathes



WHATEVER SHAPE THE FUTURE TAKES

LIPE Carbo-matics

are flexible enough to handle the job!

One thing is certain, cutting speeds will be high in the postwar world. Only high surface speeds give top performance with carbide tools. Even so, speeds, cuts and feeds will vary widely according to the many new materials, and whether rough, finishing or intermittent cuts are being made.

That's why Lipe Carbo-Matic's wide range and multiple combinations of speeds, cuts and feeds will count heavily. Carbo-Matic's rock-like rigidity will be important, too—insuring finer finish, longer tool wear, less tool breakage, and fewer rejects. Every Carbo-Matic tests to .0005" accuracy—with perfect roundness and parallelism.

ALL THESE FEATURES

198 Spindle Speed Changes *by pick-off gears.*

Low-Gear Head *with speeds from 59 to 1151 rpm.*

High-Gear Head *with speeds from 194 to 3100 rpm.*

Feed Per Revolution *in infinite variations by micrometer control of a hydraulic orifice.*

Rigidity *that makes possible tolerances ordinarily produced by rough grinding.*

Smoothness *that only a fully-enveloping cone-worm-gear drive can give.*

Hydraulic Control *of front tool carriages, back facing attachment, work-holding equipment, and tailstock quill.*

Power *up to 20 hp, unusually high for a lathe with 8" swing, 30" between centers.*

Fully Automatic *throughout operating cycle. Loading, unloading only manual operations.*

ARMY ★ E ★ NAVY

LIPE-ROLLWAY CORPORATION

SYRACUSE 1, N. Y.

QUICK, ACCURATE PRODUCTION GRINDING *at Low Cost*

The Dumore's precision manufacture, gives it the stamina for long periods of continuous, vibrationless operation at speeds up to 42,500 r. p. m. and to .0001 inch. It has demonstrated its superiority for small diameter internal grinding, particularly, and external jobs within its range.

On a cast iron radio part hardened steel pin, ⅛ inch in diameter is driven into the cast frame; then the end of the pin is ground down to an established measurement, with a tolerance of .0015 inch. The location of the pin, between two projecting arms of the casting, with its critical measurement established in relation to the surface of the adjacent flat boss, created a problem. However, by the use of a Dumore Precision Grinder and a few simple fixtures, operation is quick and easy, production and precision of results are high.

The Dumore Precision Grinder, in combination with standard machine tools, or with simple accessories, is helping to speed the production of precision parts in numerous plants. When special purpose machinery is unavailable, *or the expense unwarranted,* Dumore is supplying the answer to critical production problems. Your distributor will gladly give you detailed information on the "Dumore System." Consult him freely on any grinder problem, or write direct to The Dumore Company, Tool Division, Dept. TF14, Racine, Wis.

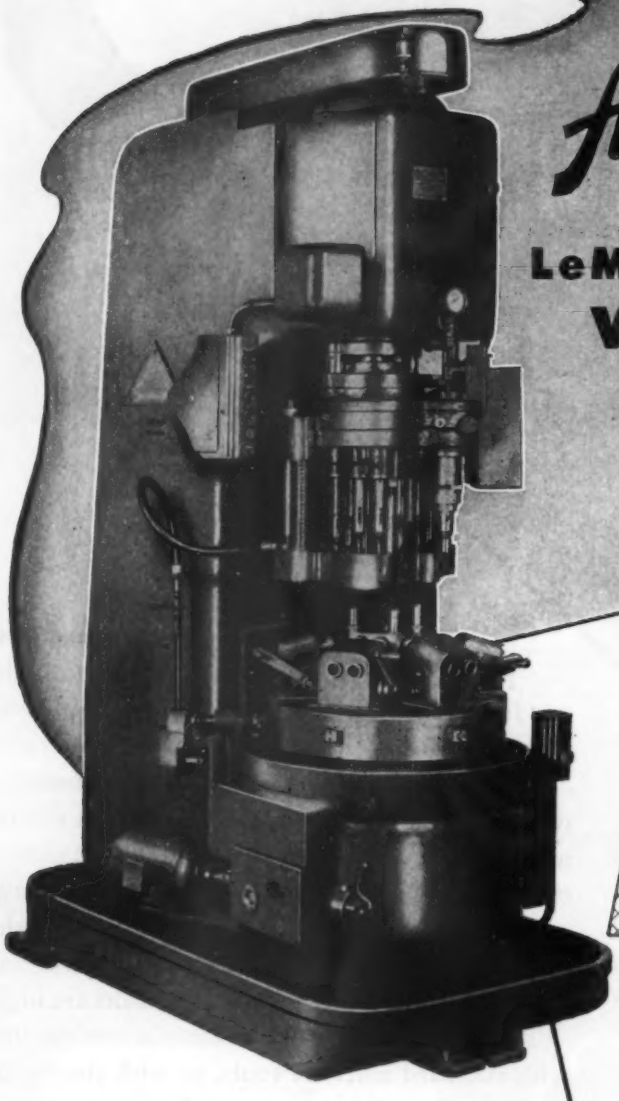
General Catalog 42 is full of helpful suggestions for making broader use of the Dumore Precision Grinder on Production — Get your copy Now!

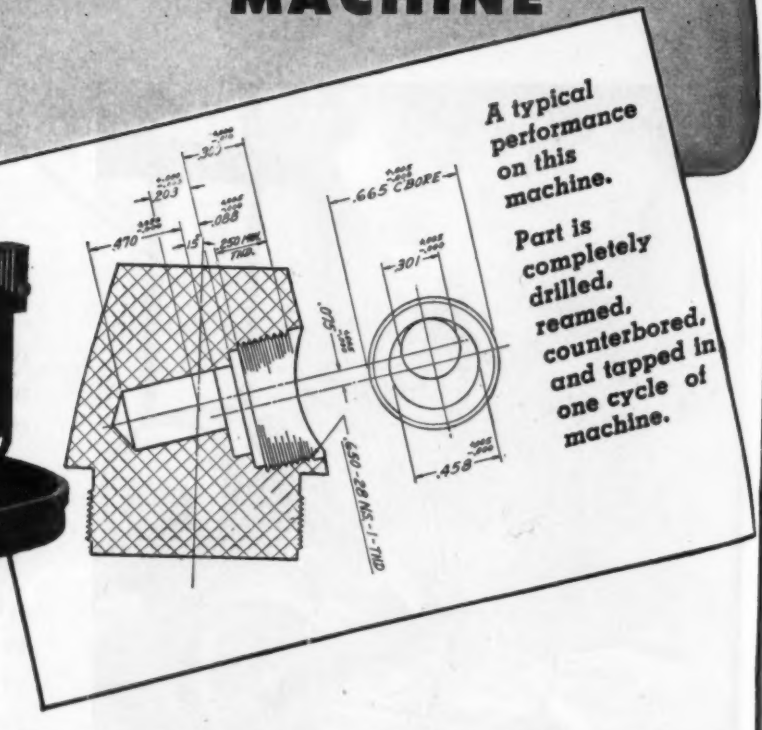
DUMORE

PRECISION AND OFF-HAND GRINDERS

SOLD BY AUTHORIZED INDUSTRIAL DISTRIBUTORS IN ALL PRINCIPAL CITIES

Another APPLICATION OF THE LeMaire No. 10 Standard VERTICAL DRILLING MACHINE





A typical performance on this machine.

Part is completely drilled, reamed, counterbored, and tapped in one cycle of machine.

This LeMaire Standard Vertical Drilling Machine lends itself to many applications. Here the standard Twin Ram Unit is equipped with a multiple head carrying 10 spindles for drilling, rough and finish counterboring, and tapping. (Tapping spindles are an auxiliary attachment in the head.) All these operations are performed in one cycle of automatic index table having 5 working stations and 1 loading station. The machine produces 300 pieces per hour, net. The detailed diagram enables you to determine how adaptations can be made to your requirements.

Standard vertical machines are available in three sizes—3 to 15 H.P. Standard horizontal machines are available with units up to 20 H.P.

Consult us NOW regarding your postwar plans in production.

BUY WAR BONDS

LeMaire TOOL & MFG. CO.

2665 S. TELEGRAPH ROAD ▲ DEARBORN, MICHIGAN

ENGINEERS AND BUILDERS OF PRODUCTION MACHINES

ALUMINUM—Extruded bars. 75.2 square inches per minute cut on the Zephyr.

MAGNESIUM—10" thick. Zephyr cuts 120 square inches per minute.

WOOD—ROCK MAPLE, 380 sq. in. per min. MAHOGANY 432 sq. in. per min. PREGWOOD, 1⅜" thick, 76 sq. in. per min.

DoALL ZEPHYR

Cutting Speed up to 10,000 F.P.M.

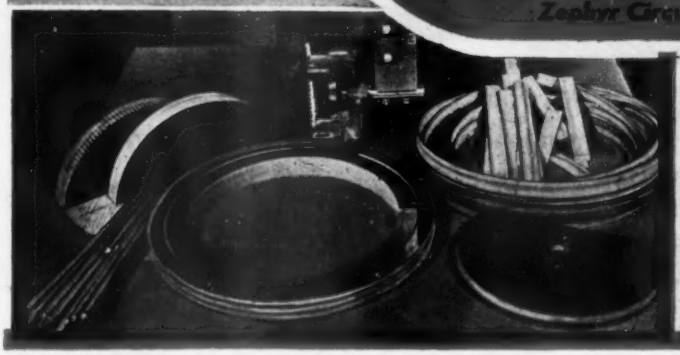
Has cutting and shaping the new light alloys stumped you and your present band saw?

Don't worry—the new DoALL Zephyr was developed especially for these lightweight metals, also for plastics, laminates, plymetals, alloys, wood, etc.

Here's safe, smooth speed up to two miles a minute, supported in a Gibraltar-like housing of welded steel. Equipped with Speedmaster and Job Selector for quick selection of proper saw and speed for each new job.

Send for interesting Illustrated Zephyr Circular today.

PLASTICS — BAKELITE ¼" thick, 106 lin. in. per min. SPAULDITE ¼" thick, 82 lin. in. per min. INSUROK (below) 16 sq. in. per min.



DoALL

INDUSTRY'S NEW SET OF TOOLS

Write for Literature

CONTINENTAL MACHINES, INC.

1310 South Washington Avenue • Minneapolis 4, Minnesota

Sales & Service Offices: Baltimore, Boston, Chicago, Cleveland, Denver, Detroit, Erie, Houston, Indianapolis, Los Angeles, Milwaukee, Minneapolis, New Orleans, New York, Orlando, Philadelphia, Pittsburgh, Portland, Rochester, Rockford, St. Louis, San Francisco, Seattle, Toledo, Tulsa, West Hartford.

FINISH SMALL PIECES

Fast

HANCHETT

NO. 24

SURFACE GRINDER

Showing comparative size of the No. 24 60"x108" and the No. 36 68"x128"

24-inch Magnetic Chuck shown loaded with a quantity of cutting tools for finishing.

Similar in construction to the well-known Hanchett No. 36, the No. 24 Rotary Surface Grinder is electrically powered, controlled from a panel of push-buttons . . . equipped with a 24- or 30-inch magnetic chuck for easy, time-saving set-ups . . . the grinding wheel head is dynamically balanced, assuring constant accuracy.

Valuable floor space is saved, too, through the built-in coolant tank and the compact floor — dimensions of the No. 24, only 60" by 108".

The versatility of this machine will make it an integral part of your production plans — while primarily suited for fast output on small pieces, the No. 24 handles work up to 36 inches in diameter and up to a height of 14 inches.

The No. 24 comes equipped with either segmental or cylindrical type grinding wheels, as your needs require. Write for additional details, in bulletin 170A-8.

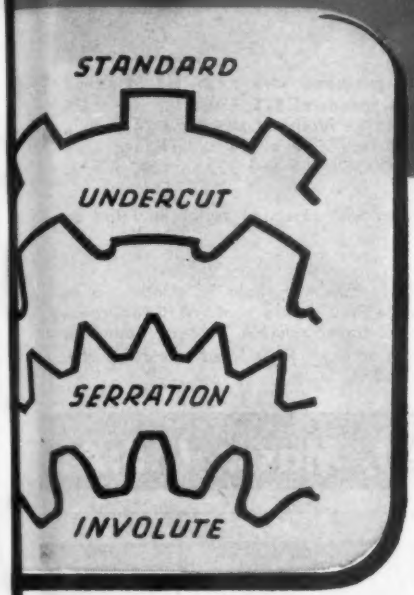
HANCHETT GRINDERS

IF IT'S A FLAT SURFACE—THERE'S A HANCHETT TO GRIND IT

HANCHETT MANUFACTURING CO.

BIG RAPIDS, MICHIGAN U.S.A.

FORMED WHEEL GRINDING



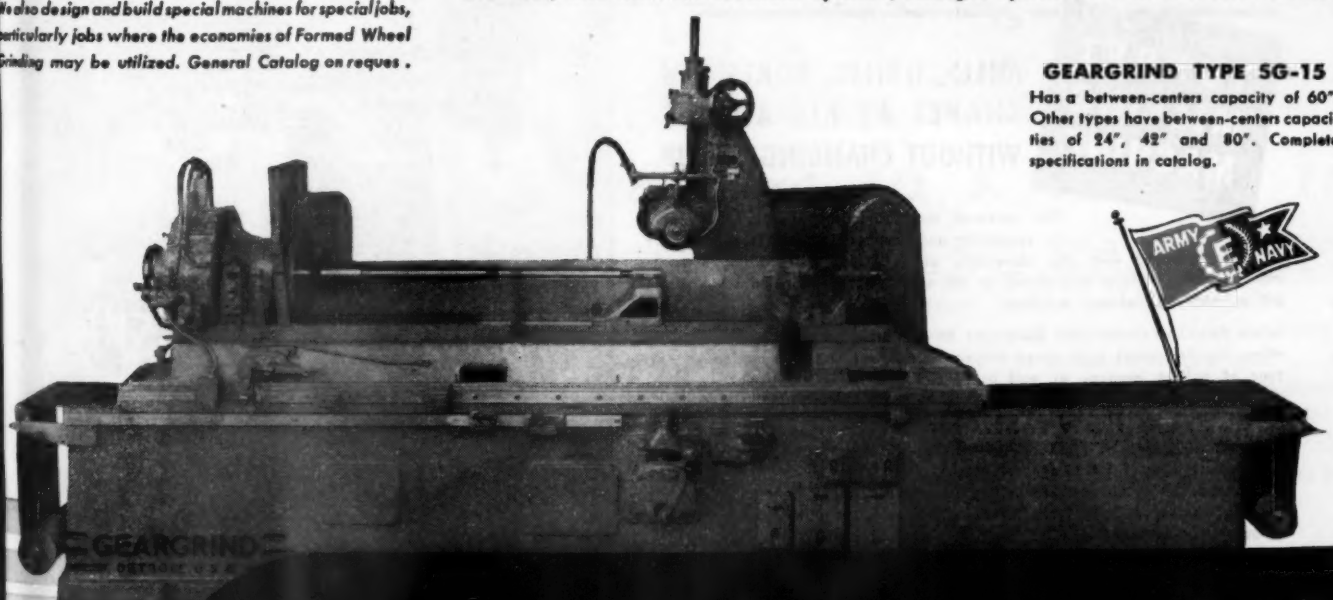
EXTERNAL SPLINES and SERRATIONS

GEARGRIND Machines grind production runs economically, while retaining the close tolerances demanded by your engineers. In producing spline gauges and spline broaches, where extreme accuracy and high finish are required, GEARGRIND Machines are tops. May be equipped with adjustable micro table stop, for grinding splines of cramped design or blind spline runout.

Sound engineering, painstaking craftsmanship, semi-automatic operation and smoothness characterize these machines. They employ the same type of low pressure, hydraulic system used in the complete line of GEARGRIND Machines in the formed wheel grinding of external and internal gears, external, and internal involute splines, straight splines, serrations and racks.

We also design and build special machines for special jobs, particularly jobs where the economies of Formed Wheel Grinding may be utilized. General Catalog on reques .

GEARGRIND TYPE 5G-15
Has a between-centers capacity of 60". Other types have between-centers capacities of 24", 42" and 80". Complete specifications in catalog.



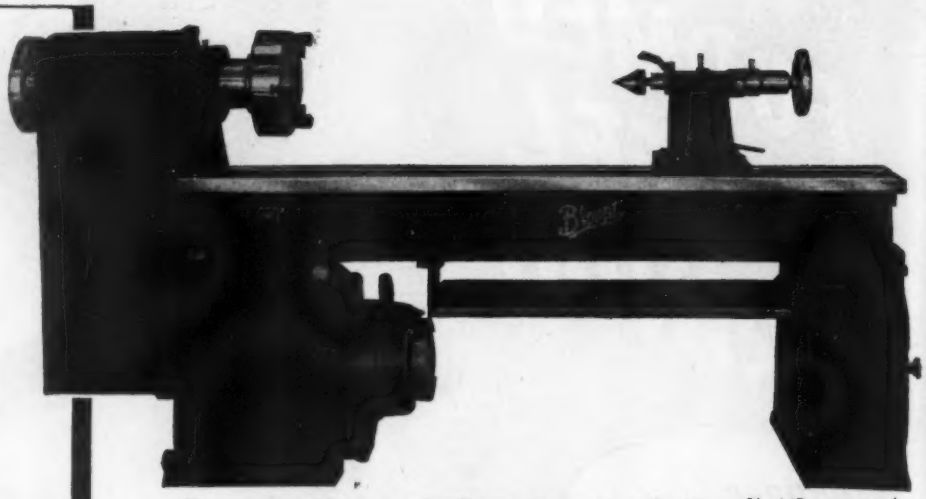
The GEAR GRINDING MACHINE COMPANY
DETROIT 11, MICH. U.S.A.

"Blount"

MODEL B-3

Special Application

LATHE



. . . a **NEW DESIGN** *for turning, chucking, polishing and lapping*

Ask for Bulletin D-18 giving detailed information on this machine.

This recent addition to the Blount line, equipped with a ¾ HP, 4 speed ball bearing headstock motor-in-leg, provides speeds of 515, 850, 1125 and 1725 R.P.M. It has a 20" swing and 8' bed and can be furnished also for a 24" swing.

Spindle speeds of 41 RPM to 421 RPM are available with a reduction geared motor belted to head. Other speeds, from 300 to 900 and 300 to 1800 R.P.M. are optional.

Convenient control is provided by controller with reversing switch mounted on outside of headstock leg.

Other details of the Model B-3 include:

Spindle nose 3½" dia. 6v. threads per inch, maximum hole in spindle up to 2½" if desired. Bed 10¾" x 9½" deep with 3" wide shot. Tailstock base 10½" x 10½" with 1¾" dia. spindle with 6" travel and No. 3 Morse taper for center. Lathe Chuck 12" with safety locking screws. Rear hand wheel 11" dia. Standard equipment includes belt and belt guard.

J. G. BLOUNT COMPANY *Everett, Mass., U.S.A.*

Bridgeport

TURRET MILLING MACHINE

MILLS, DRILLS, BORES *and* SHAPES AT ALL ANGLES WITHOUT CHANGING SET UP

This universal machine is many machines in one. Its versatility and scope of operations are without parallel. Equipped with the universally used "Bridgeport" Milling Attachment, milling, drilling and boring at all angles can be handled at a single set up and with utmost precision.

While furnished as standard equipment on the Bridgeport Turret Milling Machine, the Bridgeport High Speed Milling Attachment can be mounted on any type of milling machine as well as special production equipment.

. . . *and* NOW A SHAPING ATTACHMENT

Tremendous demand for Bridgeport Machines has delayed until now the production of this much needed Shaping Attachment. It is now available not only to owners of Bridgeport Turret Milling Machines but also to machines of other manufacturers.

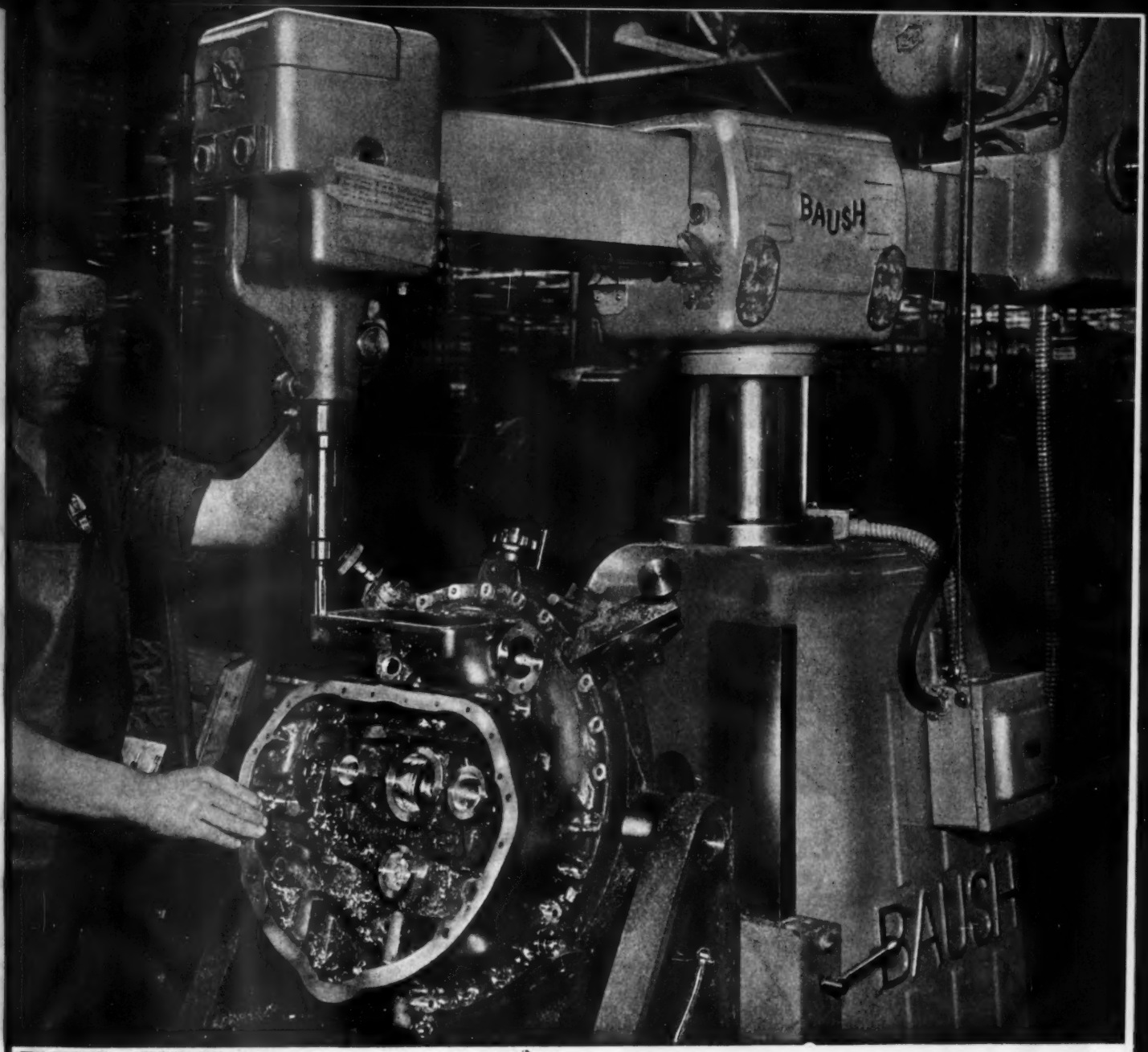
The Bridgeport Shaping Attachment (mounted on back end of overarm) provides the means for shaping and slotting at all angles and on a wide variety of work such as dies, mold work and intricate production jobs. It is of sturdy construction and convenient to use.

Write for Illustrated Bulletins giving complete details

THE BRIDGEPORT MACHINES, Inc., Bridgeport, Conn.

Specifications

MACHINE	MILLING ATTACHMENT
Longitudinal Feed—20" Cross Feed—9" Vertical Feed of Knee—16" Spindle to Table—17" Table—9" x 32"	Spindle Speeds, 275, 425, 700, 1050, 2100, 4250 Quill Travel—3½" No. 2 Morse or No. 7 B&S taper spindle ½ HP Motor



BAUSH
QUIPMENT
elps build the
"big 3"
Packard-Rolls Royce,
Pratt & Whitney,
Wright Aeronautical
IRCRAFT ENGINES

Speed tapping TO A CLASS 3 FIT

Baush Machine Tools are extensively used in the intricate, accurate, speedy manufacture of engines of war — for aircraft, for Navy and merchant ships, for the Army's mechanized equipment. Illustrated is one of these Baush Tools, the popular and efficient Precision Tapping Machine, set up in a mid-western plant for tapping on Pratt & Whitney aircraft engine parts. As set up above, seven holes are tapped around the carburetor pad . . six holes tapped inside carburetor pad . . six more tapped around a circular boss . . four in the selector valve pad . . all tapped to a Class 3 fit! Although production figures are confidential it is obvious that Baush Precision Tapping Machines deliver outstanding performances.

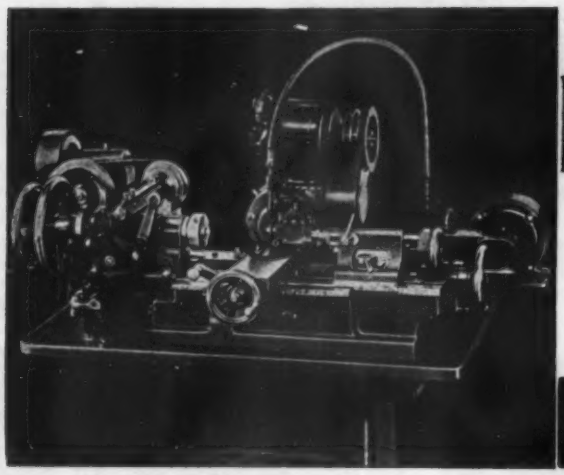
Details on all Baush Machine Tools upon Request

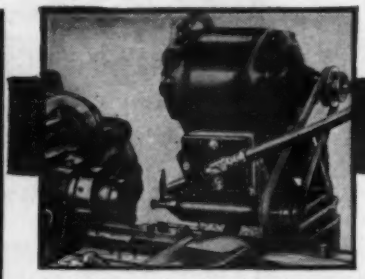
BAUSH

MACHINE TOOL COMPANY

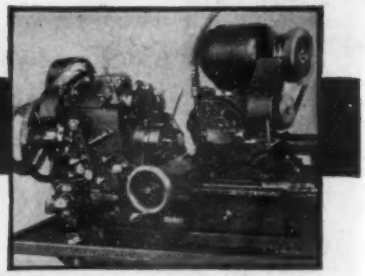
SPRINGFIELD, MASS.
DETROIT, MICH.

MEANS BUSINESS





Machine equipped with Internal Threading Attachment having special motor driven cutter head.



Machine equipped with Relieving Attachment. Lead screw is replaced by a special work head.

WALTHAM THREAD MILLERS

Produce standard and special thread forms with utmost precision and speed

These versatile machines will produce V, N, Whitworth, Buttress and other thread forms accurately and at a high rate of production. Regardless of the type of thread, convenience, speed and high precision are definitely assured.

The capacity of these machines is such that precision threads and small worms can be produced up to 2" in diameter. However, they will swing pieces as large as 3" diameter. They can be furnished for single or multiple cutter use.

An important feature is the use of three motors — for speed, feed and oil respectively — which permits individual speed change and reverse for both cutter and work and a constant speed for the pump. All motors are controlled from a single start and stop station.

• • •

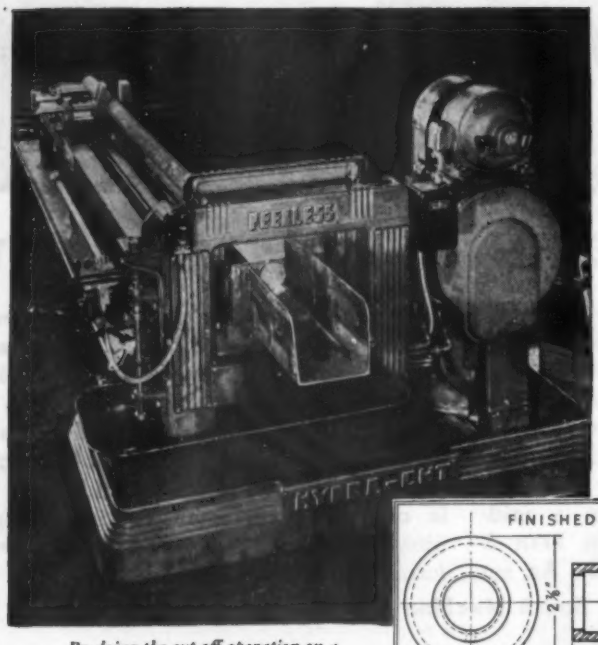
Write for complete information.

WALTHAM MACHINE WORKS

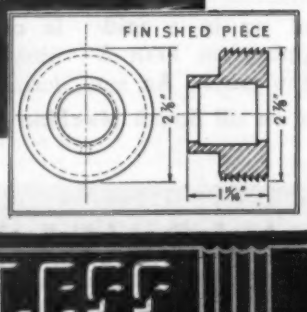
WALTHAM, MASS.

WALTHAM TRADE MARK REGISTERED U.S. PAT. OFF.

Take the Load Off Your Turret Lathes!



By doing the cut-off operation on a precision, Peerless Automatic Saw more finished parts were produced in the Lathe Dept., at less cost.



Peerless Precision Sawing Saves Time, Machines and Men . . .

TO break a "bottle neck," this part made from 3" round x 1335 hot rolled stock, was cut off at the rate of 7 sq. in. per min. in a 7" x 7" Peerless Hydra-Cut Saw.

Smooth, straight-line metal sawing at high speed, with no surface hardening or fracture, is standard performance with Peerless Metal Sawing Machines. Taking as little as 1/16" for the cut, Peerless gives you more usable pieces from each piece of stock. Tell us about your toughest metal sawing operation. Fit Peerless into your postwar plans. Let's see if we can help.

PEERLESS MACHINE COMPANY

PEERLESS MACHINE COMPANY, Dept. AM-644, Racine, Wis.

- ☐ Mail catalog on Hydra-Cut Saw for High Production Cutting
- ☐ Mail catalog covering Vertical Type used for Die Block Work
- ☐ Mail catalog on Mechanical Type Saw for production cutting
- ☐ Mail catalog on general utility and maintenance Saws

Company_____

Individual_____

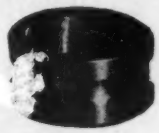
Street_____

City_____ State_____

GREATER ACCURACY—MORE PRODUCTION ON PARTS LIKE THESE with the SUNNEN PRECISION HONING MACHINE

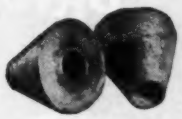
Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit.

Roller Bearing Outer Race. Finish improved from 12 micro inches to 2 micro inches.



Inner Bearing Ring "Accurately removes last 'tenth' of stock."

Saved time in producing a smooth accurate finish on this bronze remote control valve body.



Cones for Wheel Balancing Machine "Accurately align hones two interrupted surfaces."

Hydraulic Two-Way Control Valve. Hole is honed to eliminate leakage.

Automobile Distributor Shaft Gears. Taper removed at a rate of 80-90 per hour.

Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 inch."

Aircraft Valve Guide. Valve tappet roller pin hole honed to 6 micro inch finish.

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

Aircraft Hydraulic Brake Cylinder. Honing 3 times faster than lapping — and gave a straighter hole.

Aircraft Piston Pin. Sunnen honing is twice as fast and gives a cleaner, better looking pin.

Now you can get even greater accuracy and more production per hour than ever before with the improved Sunnen Precision Honing Machine. This machine is now furnished with a larger base containing a coolant pump, which provides a constant flow of honing fluid to the part being honed. The fluid acts both as a coolant and a lubricant, giving better honing properties to the abrasive. You get a smoother finish, more accurate work in less time.

Consider These Advantages, Too

- **Hones and finishes internal cylindrical surfaces from .185" to 2.625"**
- **Can be used in any metal or plastic except lead or babbitt**
- **Does not require skilled labor**
- **Accuracy guaranteed within .0001"**
- **No jigs or fixtures needed**
- **Economical to operate**
- **Quickly and easily set up**

The coveted Army-Navy "E" waves over the Sunnen plant—evidence of the important part Sunnen equipment is playing in the war effort.

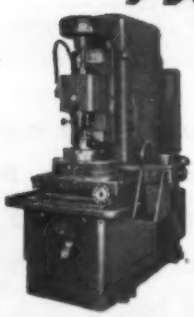
Why not write today — asking a Sunnen engineer to show you how it can be used on your jobs — or ask for a bulletin giving complete information?

SUNNEN

SUNNEN PRODUCTS COMPANY, 7941 Manchester Ave., St. Louis 17, Missouri

Canadian Factory: Chatham, Ontario

Now is the time to talk to SNYDER about ways and means to control PRODUCTION COSTS!



SNYDER KNOWS HOW

This special-purpose automatic cycle machine, designed and built by Snyder, mills three pairs of slots, each slot connecting two holes, in a gear flange.

Two-spindle head with ball-bearing mounted spindles advances rapidly toward work which reciprocates slowly through an arc the length of the slot. Hydraulic feed moves the tools into the work in small steps of .010″ to .060″ per reciprocation of the part.

As each pair of slots is cut, tools retract rapidly, hydraulic feed is automatically reset and the fixture is indexed 60 degrees, bringing the flange into position for the next cycle. Index drive is through splined shaft and worm wheel. Reciprocation of main table is through rack and pinion by means of hydraulic cylinder plungers.

Figures on post-war price tags will be decided by figures on post-war production cost sheets—which in turn will be governed by the efficiency of production machines and of the workers who operate them.

The special-purpose machine offers positive and reliable means for controlling the various processing factors—speed, accuracy, finish, etc.—which govern cost. Designed to perform one or a series of operations which may be simple or complex, it operates upon an automatic time cycle, predetermined by your production objectives. Time is controlled.

Tolerances and finish likewise are predetermined and are maintained uniformly and automatically, minimizing the ratio of rejects and scrap. Quality is controlled.

Automatic operation, by reducing the factor of human skill prevents excessive tool cost. It also increases the safety factor.

Because of these advantages, the special-purpose machine will be a major factor in deciding the figures to be written upon post-war price tags.

The time to plan your machines for post-war production is NOW—while there is time to design and build them BEFORE they are actually needed. Designed now, they can be built as soon as present restrictions are lifted, installed in your production line, ready to go when materials are made available.

By reason of its 20 years experience in designing and building special-purpose machines, the Snyder organization is particularly well qualified to help with your production problems—and is ready to consult with you on the initial steps NOW. We invite you to write in full confidence. Snyder Tool & Engineering Company, 3400 E. Lafayette Ave., Detroit 7, Michigan.

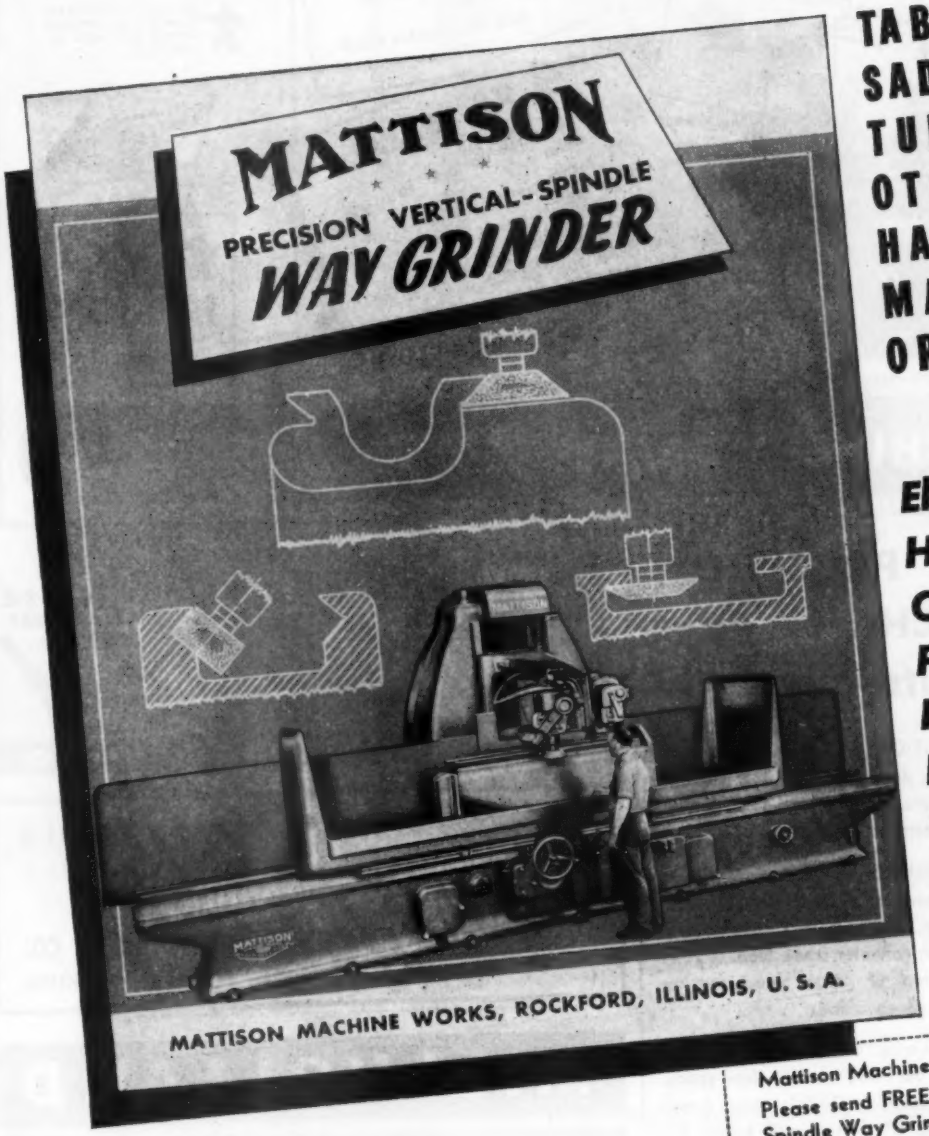
PLAN Your PRODUCTION
when you
PLAN Your PRODUCT

SNYDER
DESIGNERS AND BUILDERS OF
SPECIAL-PURPOSE MACHINES
FOR HIGH PRODUCTION
AT LOW UNIT COST

20 Years of Successful Co-operation with Leading American Industries

A NEW MATTISON GRINDER

for Finishing



TABLES—SLIDES—SADDLES—HEADS—TURRETS AND OTHER PARTS HAVING ANGULAR MACHINED WAYS OR SURFACES—

Eliminates Costly Hand Scraping Operation . . . Permits Grinding Parts Having Hardened Ways to Closest Accuracy and Fine Finish . . .

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Mattison Machine Works, Rockford, Illinois
Please send FREE Circular on new Mattison Vertical-Spindle Way Grinder.

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Firm _____

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City _____

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ROCKFORD · ILLINOIS

MOREY TURRET LATHES
for BAR or CHUCKING { UNIVERSAL or PLAIN

3 UNIVERSAL
For bar stock up to 1½" in diameter
10" turning length
16½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM.
constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A

2 PLAIN-GEARED
For bar stock up to 1" in diameter
Turning length 6½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
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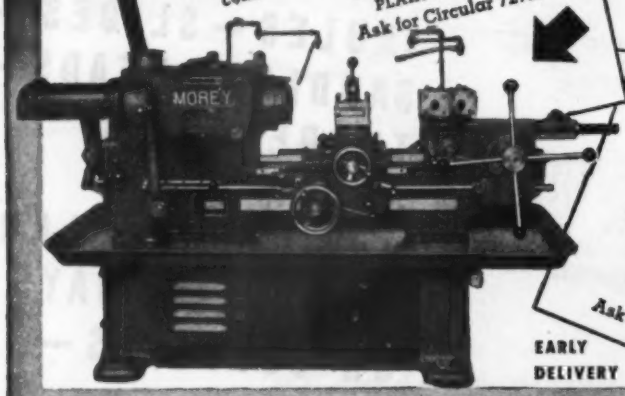
4 UNIVERSAL
For bar stock up to 2" in diameter
12" turning length
19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM. constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 736A



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- INFINITE SPINDLE SPEEDS —Electrically Selected—
- DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (pinions applied for).
- GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.
- SPINDLE MOUNTED ON TIMKEN BEARINGS.
- RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS MODERN TOOLS WELL WITHSTAND.
- SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.

ARMY E NAVY

THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

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PRECISION ACCURACY for small work on dies, jigs, patterns, fixtures, molds, etc., is the LINLEY'S duty in busy toolrooms.

Toolmakers like the fast set-up, the quick changeover, the 8 spindle speeds (275 to 4250 r.p.m.), the velvet smooth micrometer screw feed . . . and the saving of larger machines for their rated capacities.

The Linley is compact, rugged, requires but 18½" x 20" floor space. Table size 7" x 17½"; table travel 10" long, 6" cross; quill travel 3". Collets to ½" capacity can be supplied.

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KNIGHT VERSATILE MILLERS ACCURATE - RIGID

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½ to 20 HORSEPOWER DRIVE

AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY

W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.

L-W UNIVERSAL DIVIDING HEADS

Model AU-Full Universal for Complete Indexing and Spiral Cutting, $194.65

Model BP for Plain Milling Machine, $128.55

● Surprisingly low in price, yet built to high quality standards, the new l-W 11" Universal Dividing Heads offer utmost accuracy at a cost lower than any comparable equipment on the market. The unit is constructed with many new features to increase their accuracy and their use for practical, profitable shop work.

HEADSTOCK—New, ruggedly designed for maximum rigidity. Can be swiveled to any angle.

TAILSTOCK—New design, heavier and stronger.

HEADSTOCK SPINDLE—Tapered bearings, bored for No. 10 B & S Taper. Increased diameter and length. Threaded nose, 2¼" diameter 10 thread USS.

WORM—Made from special alloy steel, accurately finished, and thrust taken by ball bearings. Provisions are made for easy accurate adjustment of worm wheel.

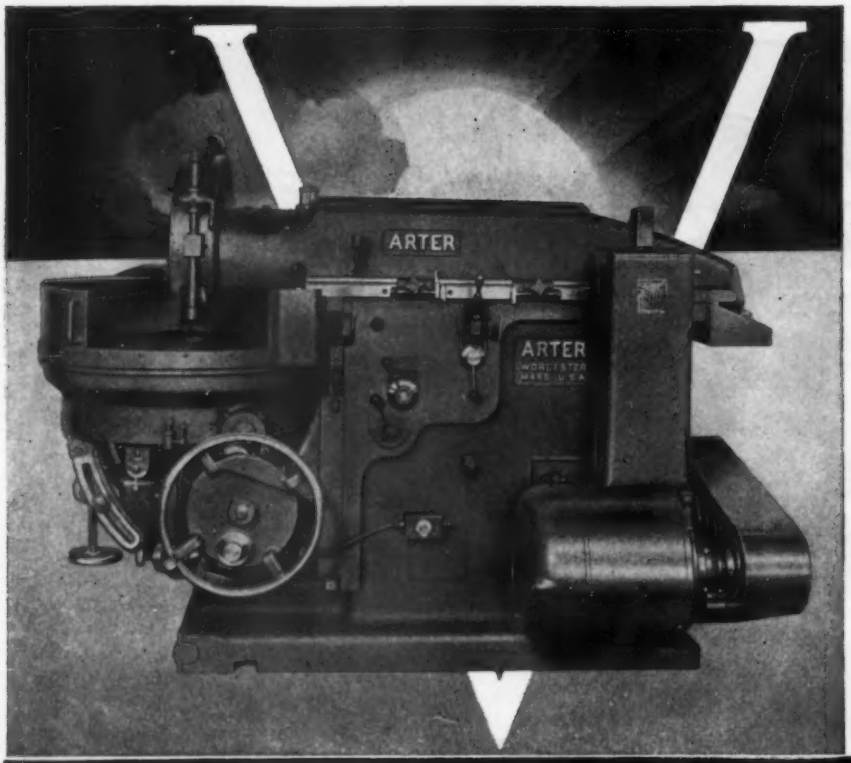
WORM WHEEL—Large diameter, 40:1 ratio, accurately generated, securely mounted on spindle.

EQUIPMENT—⅝" table slot tongues, three index plates furnished, dividing all numbers to 50, and even numbers to 100, with the exception of 96T. Index chart furnished shows all divisions obtainable to 380.

When ordering AU Heads, specify either right or left hand model.

Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products

L-W CHUCK COMPANY 5 N. ST. CLAIR ST. TOLEDO 4, OHIO



Versatility is a well recognized quality in Arter Rotary Surface Grinders and versatility is highly important in production changes that these changing times are sure to bring.

Progressively developed, precisely engineered, Arters are worthy of the highest type of American production methods which are today, winning the war. For today's demands and for tomorrow's new problems — Arters.

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FRANK E. EBERHARDT, *President*

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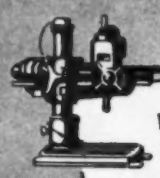
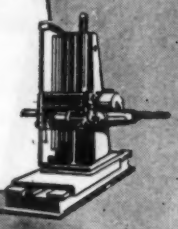


PRODUCTION SPEEDING RADIAL DRILLS AND HORIZONTAL DRILLING, BORING AND MILLING MACHINES

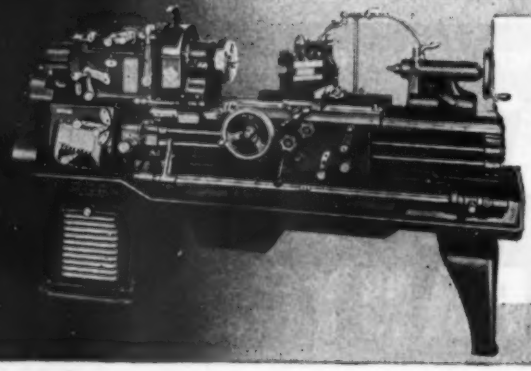


DETAILS ON REQUEST

THE CINCINNATI GILBERT MACHINE TOOL CO.

CINCINNATI, OHIO

CINNATI LATHES



Inherently accurate on every job

In every detail of design and construction, accuracy of these modern, convenient lathes assures precision performance. For example: gears are cut to closest tolerance, hardened and ground; spindle is mounted on roller bearings taking thrust in both directions; ways and carriage are hand scraped to closest precision. A massive bed construction provides strength and stiffness which contribute to overall accuracy on heavy cuts. Sizes from 14" to 30". Supplied with proper equipment for machining different size Shells.

THE CINCINNATI LATHE & TOOL CO.

Rogers Road, Oakley SPECIALISTS SINCE 1906 Cincinnati, Ohio

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Tracer-Controlled MILLING

Tracer Control SAVED 120 HOURS Duplicating Eight (8) Die Molds for Plastics

8 Dies Duplicated from 1 Original Master

ON THIS TYPICAL JOB that previously took 40 hours per die—the Gorton Duplicator gave this manufacturer a Tracer-Controlled machining method that saved 15 hours' actual machining time per die in the production of 8 die molds for plastic handles. Simplicity of setups and Gorton improved finish which eliminated any hand finishing operations brought additional savings.

You will find the Gorton 8½-D Duplicator the ideal machine tool for all kinds of die and mold work, capable of duplicating any part accurately with extremely fine finish. On many war jobs today, Gorton Duplicators are paying for themselves in savings effected.

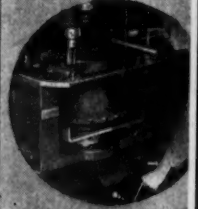
PRODUCTION DATA

Material—Machine Steel.
Operation—Duplicating Die Molds for Plastic Handles.
Speed—Roughing, 500 r.p.m.
Finishing, 1100 r.p.m.
Time—25 Hours per Mold, Floor-to-Floor.
Holding Method—Simple Table Vise.
Accuracy—.001" with Extra Fine Finish.
Savings with Tracer Control—15 Hours per Die—Total Savings—120 Hours per 8 Dies.

FREE ENGINEERING SERVICE

There is a "Tracer-Control" solution to your machining problem. Submit it to Gorton engineers who have had more than 50 years of practical experience in the development of Tracer-Controlled Milling. Call on your nearest Gorton Dealer, or write to the Gorton factory at Racine, Wisconsin.

The Right Size The Right Type of Machine for Every Job . .
From 2 oz. to 2 ton
DIE BLOCKS



Tracer-Controlled MILLING

Tracer-Controlled DUPLICATING

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GORTON Precision MACHINES

ARMY E NAVY

CUTTER GRINDERS
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A grinder is no place for social gatherings. Several workers "ganging up" around one grinder means vital man and machine hours lost . . . upset production schedules . . . extra costs of operation . . . lower plant morale.

To get greater output per worker, install a battery of several Low-Cost Queen City Grinders. They'll quickly pay for themselves by giving you many more hundreds of actual WORK-HOURS! Queen City Grinders placed in spots handy to workers reduce plant traffic, cut down idle man and machine time . . . meet every grinding requirement, whether it's large or small lots. Agents in principal cities or write for complete details.

(Illustrated) Model 3-F, 1 H.P. Queen City Heavy Duty Grinder. A low-cost, ball-bearing grinder of unusual productive capacity and durability . . . built to handle the heaviest loads. Completely equipped, ready for instant use.

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HORIZONTAL BORING DRILLING & MILLING MACHINE

• Designed and built to meet the need for speed and accuracy demanded of today's production.

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Drilling and Tapping Machines
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DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1¼ in.

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DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

UNIVERSAL *Horizontal Boring Machine*
The only TRIWAY *Boring Machine Built*

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.

Standard Universal 3" Spindle Machine

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Again Federal steps ahead with new improvements and refinements in the design and construction of its Dial Indicators. Effective at once all models, except the "A" size, will include the following improvements:

Better Proportioned Gears— Revised gears enable more positive mounting with less danger of loosening. Greater strength in the rack gear is obtained because of its new and larger size.

Improved Pinion Bearing — The bracket supporting this bearing has been enlarged. The bearing itself is jeweled. The method of positioning it is improved. This means more precise tooth contact and more rigid support.

More Accurate Alignment — of the gear bearings in the top and bottom plate is insured by improved manufacturing methods.

Greater Strength — The rack slide is held more positively.

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The PORTER - McLEOD IS DESIGNED FOR HIGH SPEED COLD METAL SAWING

Straight, clean cuts on a truly high production basis are assured by the 8" Porter-McLeod. It is a compact, sturdy, amply powered unit designed for handling general or production work with utmost operating convenience and control. Economical quantities of bars or shapes can be "nested" and held rigidly during cutting by means of supports provided on sides and bottom combined with clamping pressure at top.

In the Porter-McLeod, the blade is supported for accurate cutting and for protection against damage. Adjustment is also provided for changes in blade thickness. Feed of blade is upward to stock with provision made to prevent weaving and buckling. Standard feeds up to 3" per minute are available. Protection against blade breakage due to hard spots in stock is provided by a friction feed disc.

This machine will handle either 8" round or 7½" square stock or the equivalent in "nested" work.

Investigate the high production possibilities of this machine by sending for descriptive Bulletin.

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HATFIELD, MASSACHUSETTS, U.S.A.

REID All Electric Automatic Feed Surface Grinder No. 2B

Equipped with Motorized Spindle

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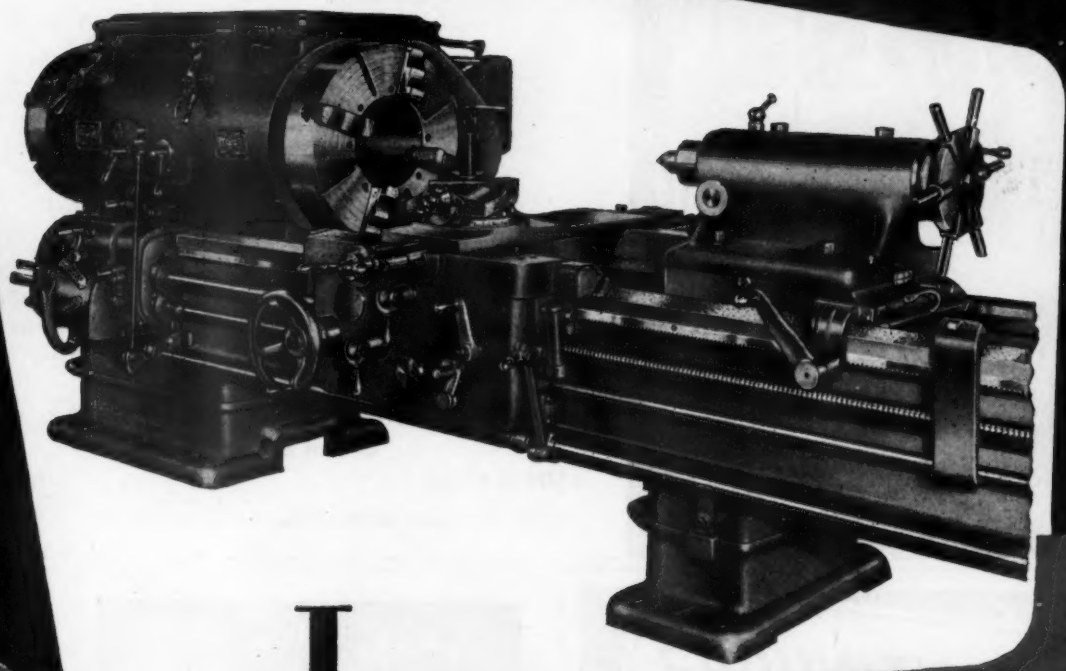
HYDRATROL LATHES

Large Hollow Spindle Type



30" Heavy Duty Lathe with 13" Hole in Spindle

In a number of big war plants they are performing important operations in 1/2 to 1/7th the time of previous practice!

FIVE SIZES–18" TO 36"

Small . . . . 18" up to 7 1/4" Hole
Medium . . . . 24" up to 12" Hole
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Large . . . . . 30" up to 14" Hole
Large . . . 36" up to 16 1/2" Hole
(Standard type lathes, 16" to 36")

Look around your own plant — you may find a number of machining jobs which are a problem to you — jobs which possibly could be done *better* on a Large Hollow Spindle Type of HYDRATROL LATHE.

Send us prints of these difficult, unusual or too-costly jobs, for a specific, time-and-money-saving recommendation.

18" Lathe with 7 1/8" Hole in Spindle

Lehmann MACHINE COMPANY

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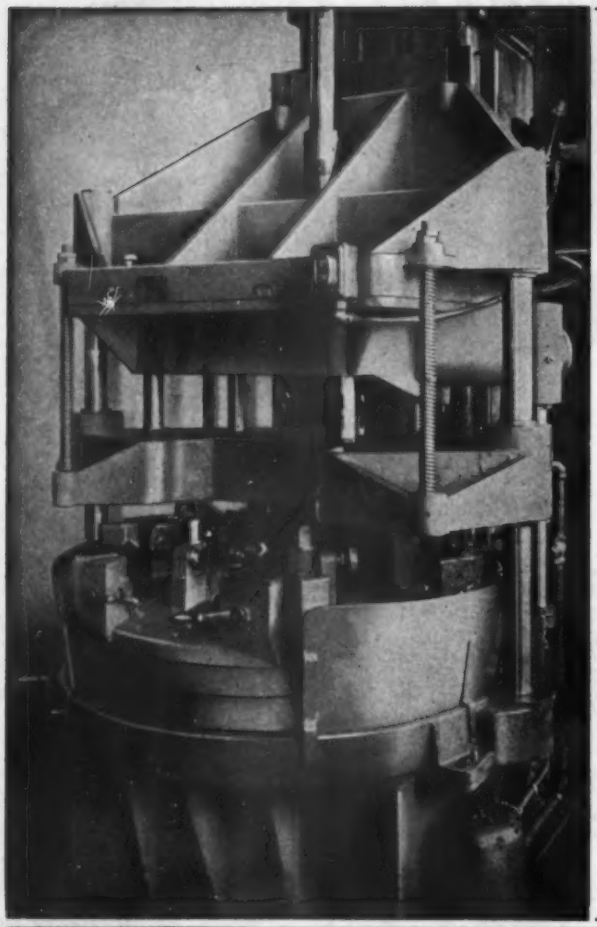

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Complete Retool of a Vertical Hydraulic Drill Press

Consists of:

5-Spindle Multiple Drill Head with one accelerated spindle for reaming in the fourth station.

Bushing Plate.

Six Fixtures mounted on a plate attached to a six-position index Table with compound trough.

This mounts on a base which is used as a compound tank.

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Specialists in Multiple Spindle Drilling, Boring, Reaming, Tapping Equipment

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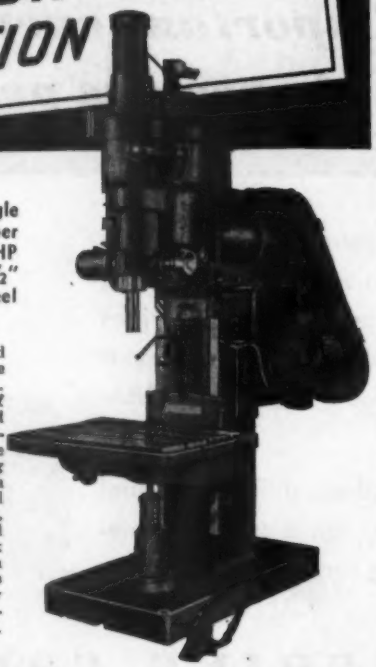

Kaufman #10 A Hi-Duty single spindle Lead Screw Tapper made in 3 HP and 1½ HP models, with ¾" N.C. and 1½" N. C. Threads in alloy steel offers these features:

Fully enclosed . . . lead screw and nut operate constantly in oil bath . . . positively wear-proof clutches instantly engaged and controlled by air cylinder . . . quick traverse when not actually cutting threads . . . accurate depth control . . . . . control to protect tap overload, and further protected against jamming if work is placed in upside down . . . class 3 fits always assured and perfectly controllable. Complete information upon request.

L. J. KAUFMAN MFG. CO.
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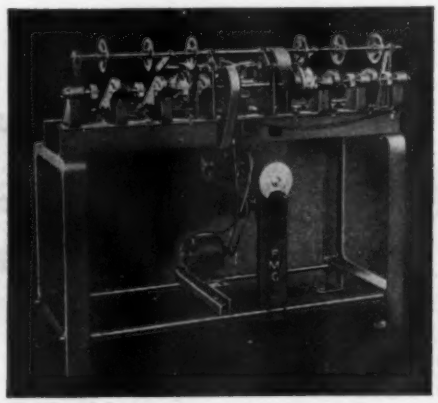

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Screw-Type Wire Spooling Machine...

For low wire speed . . . and fine wire from .002" to .010" diameter. Spools loaded or taken off while machine is in operation. The machine illustrated, six individual spooling heads and adjustable traverse, is equipped with speed reducer and variable speed drive to vary wire speeds from 40 to 120 feet per minute.

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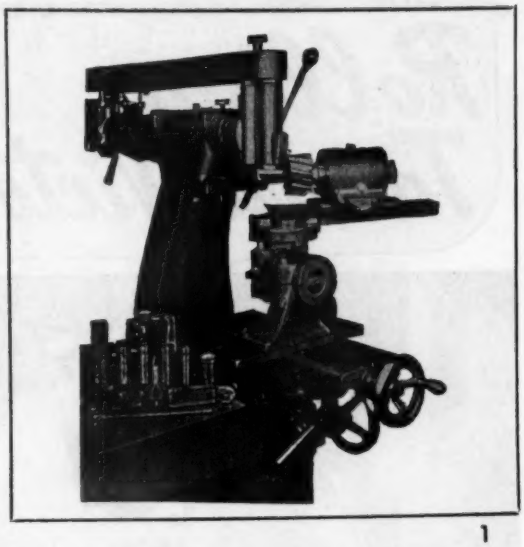

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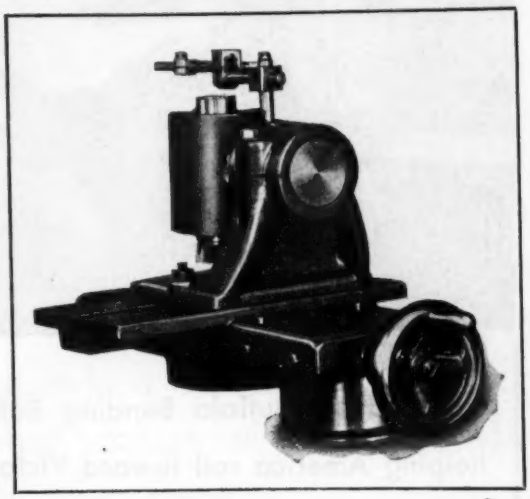

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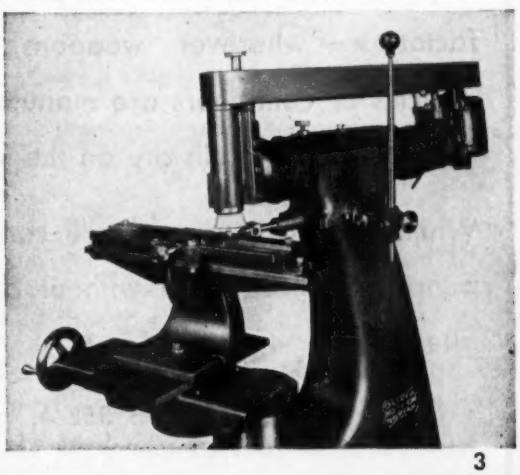

3

Don't Neglect Your Toolroom It's the Backbone of Production!

Right-hand cuts, reading downward: (1) Radius Grinding Fixture for grinding cutters 1/4" to 6" dia. with any radius up to 1". (2) Adjustable Timken Bearing Head with taper for mounting end mills and similar cutters with shanks. (3) Broach Grinding Fixture for flat broaches of any reasonable length.

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Hundreds of Buffalo Bending Rolls are helping America roll toward Victory. In airplane factories, armament plants, tank factories — wherever weapons, ships, vehicles or containers are manufactured Buffalo Bending Rolls are on the job.

When Victory is won, they'll convert to peace-time production without a single alteration.

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448 BROADWAY, BUFFALO, N. Y.

"Buffalo" Type OA Bending Rolls

The New REED BENCH DRILL

Type 25
Versatile, Rugged, Convenient and Safe

This new highly sensitive bench drill for small precision work is designed to provide infinite speed variations from 1500 to 10,000 R.P.M. instantly available by hand wheel. Its wide speed range makes it adaptable to a wide variety of work.

Of sturdy, precise construction throughout and streamlined for maximum simplicity, efficiency and safety, this machine can be depended on for all round utility, increased production and economy.

With the exception of drill chuck, all moving parts are totally enclosed making for maximum safety in operation especially by women.

The Reed Type 25 Bench Drill is made in 1, 2, 3 and 4 spindle types, drive in every case being by individual motor and belt to each spindle.

FEATURES

Base and column are only two castings speed variations obtained by Reeves Variable Speed Drive. Full ball bearing spindle employing precision bearings.

Motor - ½ H.P. Ball Bearing.

Direct drive with single belt from motor to spindle.

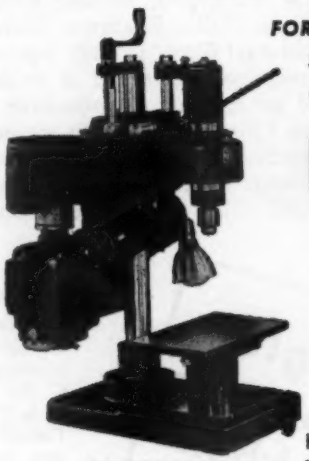
Spindle speed indicated by graduated disc.

Send for literature giving complete detailed specifications.

PRODUCTION MACHINE CO.

Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.

GREENFIELD, MASS., U. S. A.



FOR GREATER SPEED RANGE, SENSITIVITY AND EASE OF OPERATION . . .

HAMILTON
"VARIMATIC"

. . . SUPER SENSITIVE, VARIABLE SPEED DRILLING MACHINES!

★

LOW RANGE
Min. Spindle Speed 848 — Max. Spindle Speed 2700
HIGH RANGE
2900 — 9300
DRILL CAPACITY
.004" to 5/16"

Here's a unit built with "instrument precision", fully capable of handling the finest work for both defense and peacetime production. Combining sensitivity and ease of operation, the "VARIMATIC" allows instantaneous, variable speed adjustment in two ranges. (Speed changes are accomplished by means of a hand wheel. A graduated dial on hand wheel shows the speed at which the spindle is operating.) A letter will bring complete details—write!

The Hamilton Tool Co.
830 NINTH ST. HAMILTON, OHIO

This Revolution in Machine Design is Expediting War Production . . .

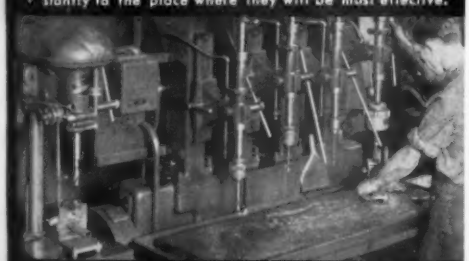
—and saving millions in initial investment and production cost

DELTA MILWAUKEE Machine Tools

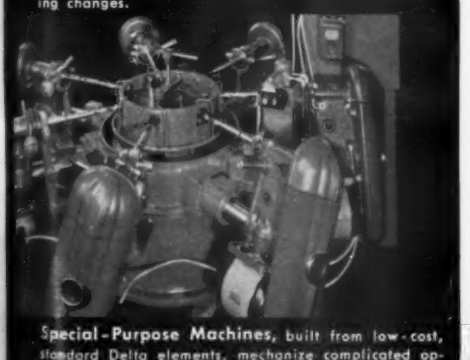
By substituting highly-engineered, modern features for costly, bulky dead-weight, Delta-Milwaukee developed a new type of low-cost, high-production machine tool—now standard throughout industry, for an amazing variety of production-line and auxiliary operations.

How Delta Tools facilitate production

Portability — Delta machines can be moved instantly to the place where they will be most effective.



Adaptability—small, compact, versatile Delta tools give you prompt tooling revisions to meet engineering changes.



Special-Purpose Machines, built from low-cost, standard Delta elements, mechanize complicated operations quickly with a small outlay.

How Delta tools cut costs

Lower Labor Costs—Highly efficient in their own right, Delta machines also provide extra operations during idle time on automatic machines.

Lower Power Costs — Delta machines use smaller motors — cutting power costs 30% to 60%.

How you get dependability and durability — with a big cut in your initial investment

Quantity Production—thousands instead of dozens — lower unit costs without sacrificing quality.

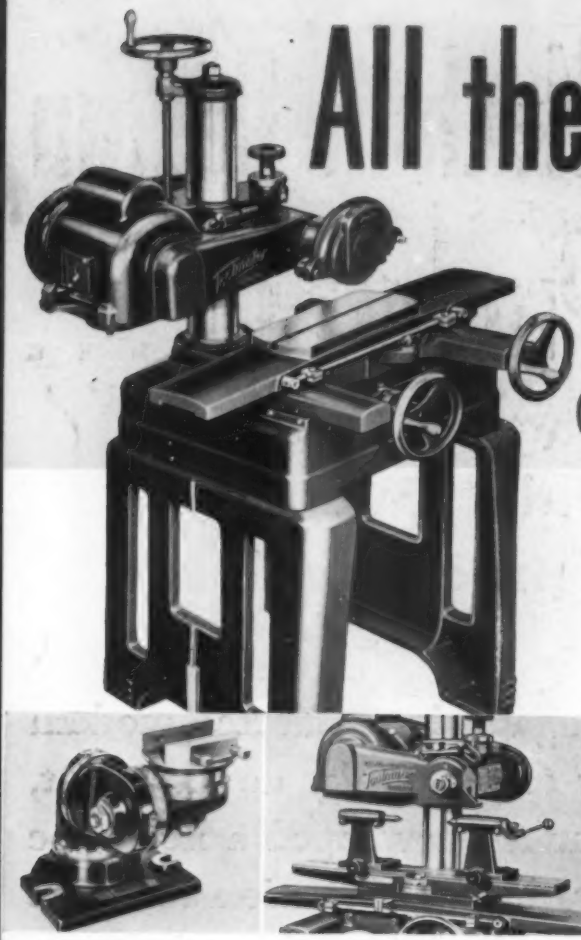
Latest Manufacturing Equipment — Delta is equipped for pre-loading ball bearings, precision-grinding, diamond boring, dynamic balancing, etc.

. . and here are the machines themselves **TURN THE PAGE**

All these DELTA machines are available...

(most of them on automatic priorities under MRO)

-to extend to almost every department of your plant the savings of the modern "Delta Way" of tooling!



Delta Toolmaker Surface Grinder
gives dependable, trouble-free results. Designed for speed and ease of operation. Convenient controls, wide graduations on micrometer for close settings, and many other features assure creditable performance.

With the Univise and coolant attachment, it serves as a dependable Chip-Breaker grinder for grinding the chip-breaker groove on carbide-tipped tools. Can be accurately reset.

With the Tool & Cutter Grinder attachment, it becomes an accurate Tool and Cutter grinder. Delta construction assures perfect alignment and freedom from play. Table surface, 5¾ x 13".

Delta Cut-Off Machine eliminates expensive finishing

Specially designed to cut plastics, non-ferrous metals, etc. to exact length with polished smoothness. With this Delta machine, polishing and burring are usually unnecessary. (Also convertible to abrasive cutting of steel). Has heavy blade guard, belt guard, and chip guard for full protection of operation.

Delta Carbide Tool Grinder Runs True

Free from vibration, for delicate grinding of carbide-tipped tools. Combined with the Delta standard tool grinder for hogging down the shank steel, it gives you a perfect working combination for sharpening tungsten carbide tools, with a remarkably small initial investment.

Delta Grinder with Twin-Lite Shields
gives you extra convenience, efficiency, safety.

Twin-Lite Safety Shields act as "built-in goggles," flooding the work with light. Tool rests fully machined. Wheels balanced to 1/10 inch ounce. Precision double-sealed New Departure ball bearings, lubricated for life. Heavy, rigid base.

DELTA-MILWAUKEE ... *pioneers of small, compact,*

DELTA MILWAUKEE Machine Tools

Amazing variety of applications in working metals — plastics — wood — and other materials — *in all these spots and many more*

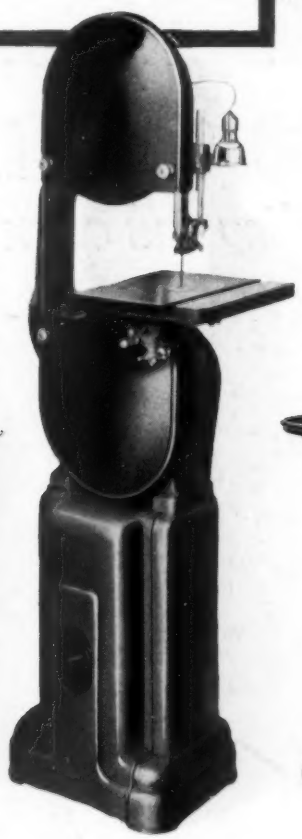
- ✓ Parts Production
- ✓ Assembly
- ✓ Tool Shop
- ✓ Maintenance Shop
- ✓ Foundry
- ✓ Pattern Shop
- ✓ Shipping Department
- ✓ Laboratory

Delta Floor-Type Multiple-Spindle Drill Presses

4-spindle model illustrated. 2-spindle model also available with one-piece table. Floor types with sectional tables: 3-, 4-, 5-, 6-, and 8-spindle.

Delta 6" Abrasive Belt Finishing Machine

Handles dozens of sanding, polishing, and finishing operations with top efficiency. Completely equipped with double-seal ball bearings. Many other quality features.

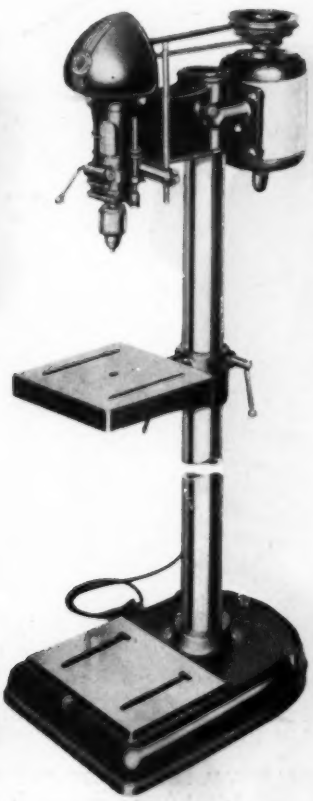


Delta 14" Metal-Cutting Band Saw

This low-cost, high-quality machine cuts anything from carbon steel to asbestos — has dozens of uses in the general tool and machine shop.

Delta Power-Feed Drill Presses

Worm-driven power feed operates directly off motor—giving 8 rates of feed for each spindle speed. Available in 24 different models.



Delta 14" Floor-Type Drill Press

Delta's patented construction provides *both* a self-aligning drive and a free-floating spindle. Built-in depth gauge, safety belt guard, and many other desirable features.

durable, low-cost machines for heavy-duty production work

140 Examples

from War Production

in Delta's new 76-page Blue Book

—demonstrating how you can . . .

save time and money

on your post-war retooling and current change-overs

Ingenious combinations of low-cost, stock-model Delta tools—devised by production men in America's leading war plants — have written a new chapter in modern tooling practice.

Safe, special-purpose machines, increasing production 200% to 600%, have been built at a fraction of the cost and in a fraction of the time ordinarily involved. This new, free, colorful book pictures and describes a wide range of applications which give your production men a running start on your own special problems . . . *Write for your free copy today.*

THE DELTA MANUFACTURING CO.
609F E. Vienna Ave., Milwaukee 1, Wis.

Please send me my free copy of your new 76-page Blue Book, and catalog of low-cost Delta tools.

Name..... Position.....

Company.....

Address.....

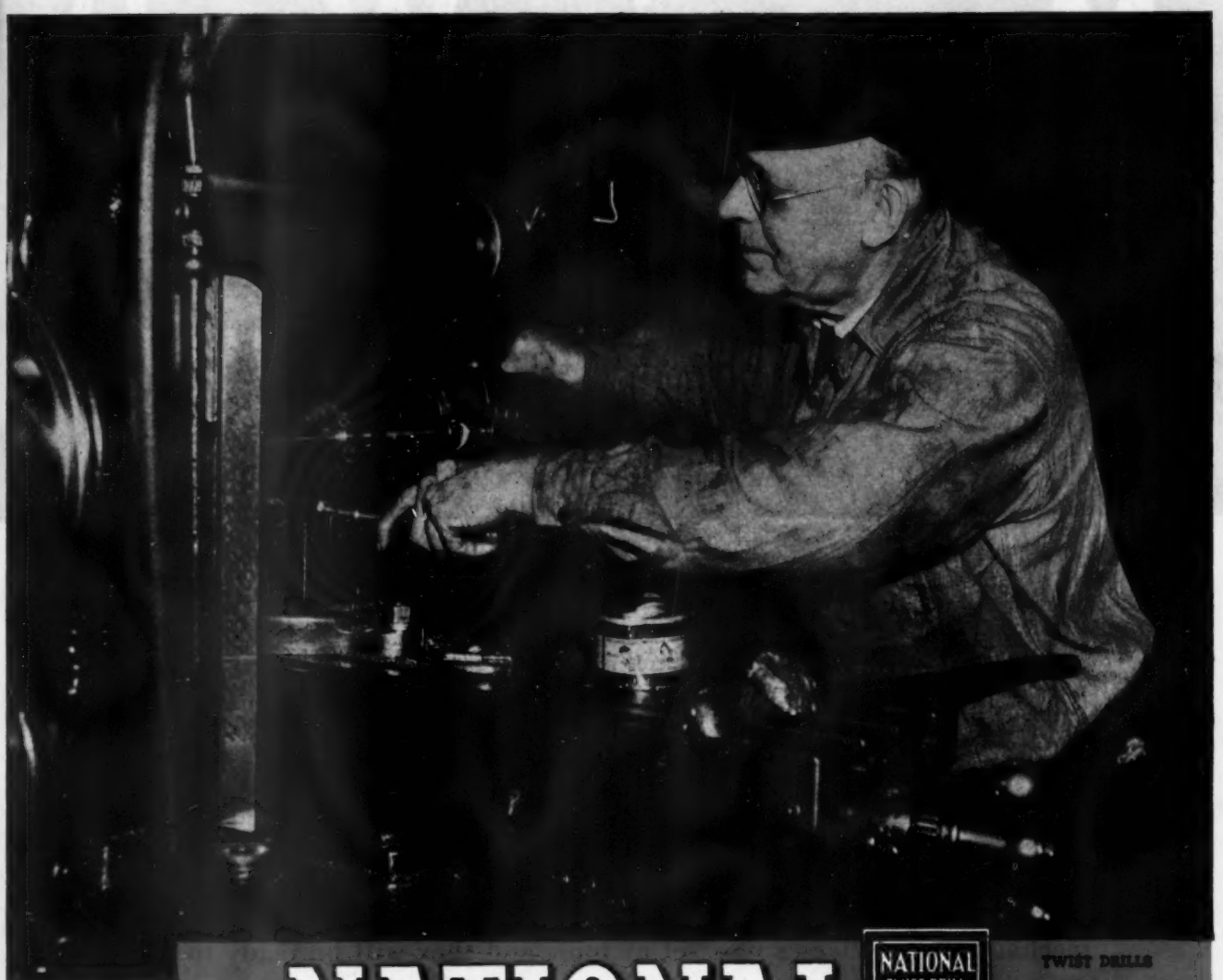
City..... (.....) State.....

Tear Out and Mail the Coupon

Send today for your free copies of these valuable books. Consult your Delta-Milwaukee distributor regarding priorities and deliveries (most Delta machines available on automatic priorities under MRO).

HANDLE WITH CARE!

Hardened tools are tough—but cutting edges are brittle. Hammering them onto arbors or into tool holders can be as harmful as dropping them on machine tables or concrete floors. Until the last shot is fired, tools are weapons. Treat 'em right!



National cutting tools, sold by leading Mill Supply Distributors, are tools of character.

NATIONAL

NATIONAL TWIST DRILL & TOOL DETROIT U.S.A.

TWIST DRILLS
REAMERS, HOBS
MILLING CUTTERS
COUNTERBORES
SPECIAL TOOLS

TWIST DRILL AND TOOL COMPANY

DETROIT AND ROCHESTER, MICHIGAN

Tap and Die Division—Wiman Brothers Co., Wrentham, Mass.

Factory Branches • New York • Chicago • Cleveland • San Francisco • Distributors in Principal Cities

Here is a New Plan for

Getting Your Money's Worth

in

MULTIPLE SPINDLE AUTOMATICS

Today there are two kinds of Acme-Gridley Automatics—

1. New up-to-the-minute designs which guarantee precision and maximum output per hour from the moment they go into production.
2. Used machines—those retired from their one-purpose war jobs on parts for tanks, guns, planes and ammunition.

The basic versatility of this second group remains unchanged. They have left in them a lot of unused production hours. Like good mechanics, give them a new set of tools and they will be ready to turn out parts for cars, refrigerators, radios and other peacetime products.

Mere age is not a measure of the production value of Acme-Gridley Automatics. The real test is how hard they have worked, and under

what conditions of care and abuse. That is the basis for deciding whether partial or complete reconditioning is necessary. Or whether the production capacity left in them should be sacrificed in favor of a new machine.

This company has a continued interest in every one of its many thousands of Acme-Gridley Automatics that are still production worthy. To help you get *all* the production value that is left in your machines, we have set up a plan for reconditioning used Acme-Gridleys in our plant—by the same skill and the same supervision that built and tooled the machines originally.

Here is the PLAN

Standard prices have been established covering the complete rebuilding of Acme-Gridley models regardless of their condition—replacing or reworking all parts that need such attention. If thorough inspection shows that certain parts are up to standard operating efficiency, rebuilding prices will be reduced by the value of any materials or labor saved.

Acme-Gridleys thus reconditioned will be returned to you with performance guaranteed equal to that of the same machine when new.

This plan applies only to models G, H, GA, R and RA and late model C. Earlier models are considered obsolete for modern production work.

Ask our representative or write us for information as to when your Acme-Gridleys that need reconditioning can best be handled at the factory. You'll find it a sound investment to deal directly with the original builder of your machines—on the basis of guaranteed know-how and efficiency. Get your money's worth!

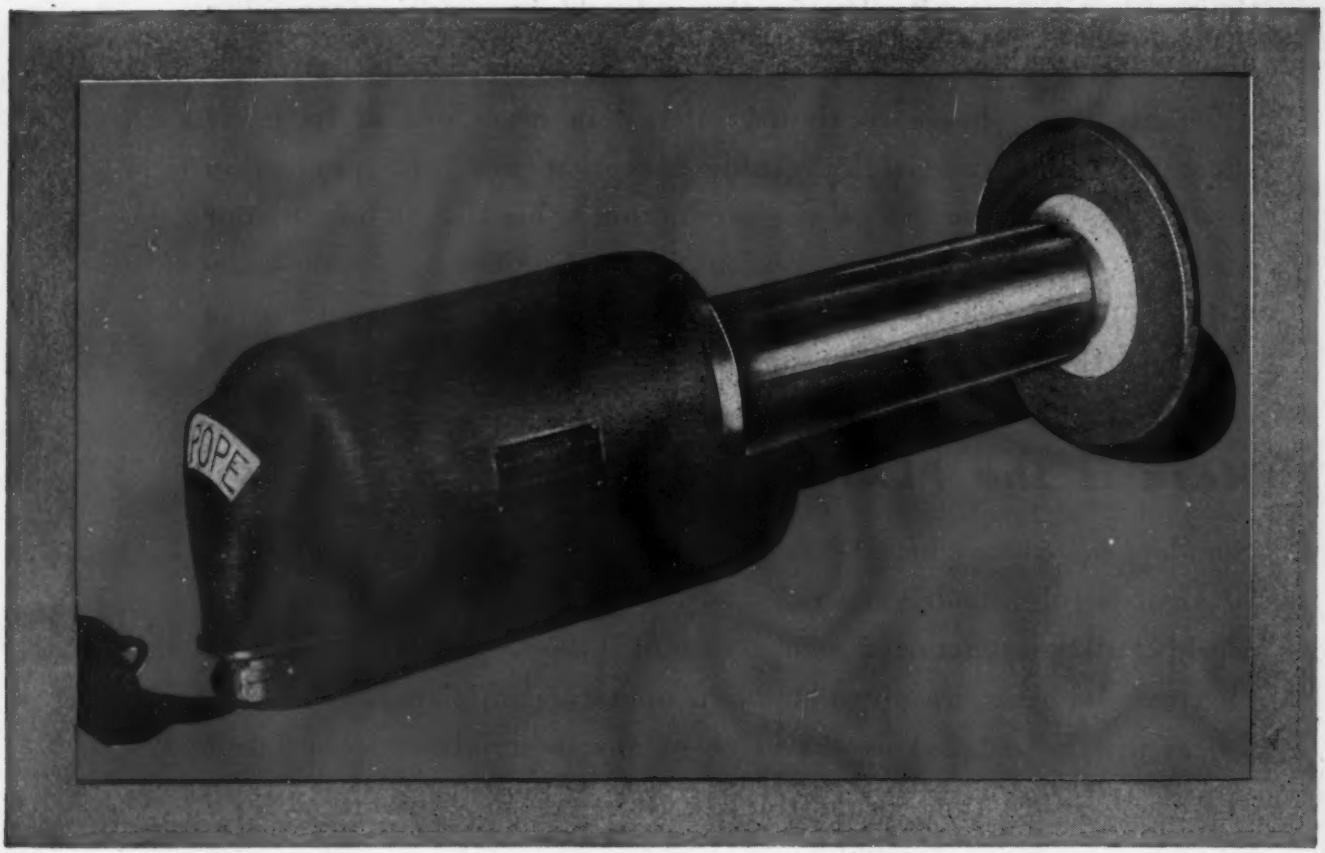
Acme-Gridley

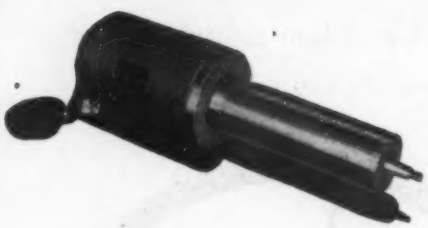
THE NATIONAL ACME CO.

170 EAST 131ST STREET • CLEVELAND, OHIO

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • THE CHRONOLOG • LIMIT AND CONTROL STATION SWITCHES • SOLENOIDS • CENTRIFUGES • CONTRACT MANUFACTURING

THIS *New* POPE SURFACE GRINDER SPINDLE





This POPE Motorized Spindle with the new G-E Motor Sealed In and SKF Roller Bearings delivers full 1 H. P. at the wheel

It is designed specially for 6" x 18" surface grinders. It also operates horizontally, vertically or at any angle on boring mills, planers, milling machines and other machine tools for special work.

Has a G-E Motor *Sealed In*

POPE engineers and GENERAL ELECTRIC engineers, working in collaboration, have produced a new motorized grinding spindle employing a motor designed specifically for operation in a *sealed housing*. Think what this means in terms of operating efficiency and economy! These Spindles always run at their best, because dust and dirt never get a chance to collect on a fan or in cooling passages causing unbalance and loss of cooling efficiency. POPE Spindles never require operator attention for lubrication or adjustment.

POPE Spindles with their fine craftsmanship, SKF Super-Precision Double-Row Roller bearings and the new *Sealed-in* construction with G-E Motor produce finer finishes than ever. At the same time they have the power, the bearing capacity and the rigidity for rapid removal of metal when required.

You have only to install one of these new completely *sealed* units to appreciate what an improvement and what savings it makes. Try it, and see for yourself!

For complete information, get in touch with

POPE

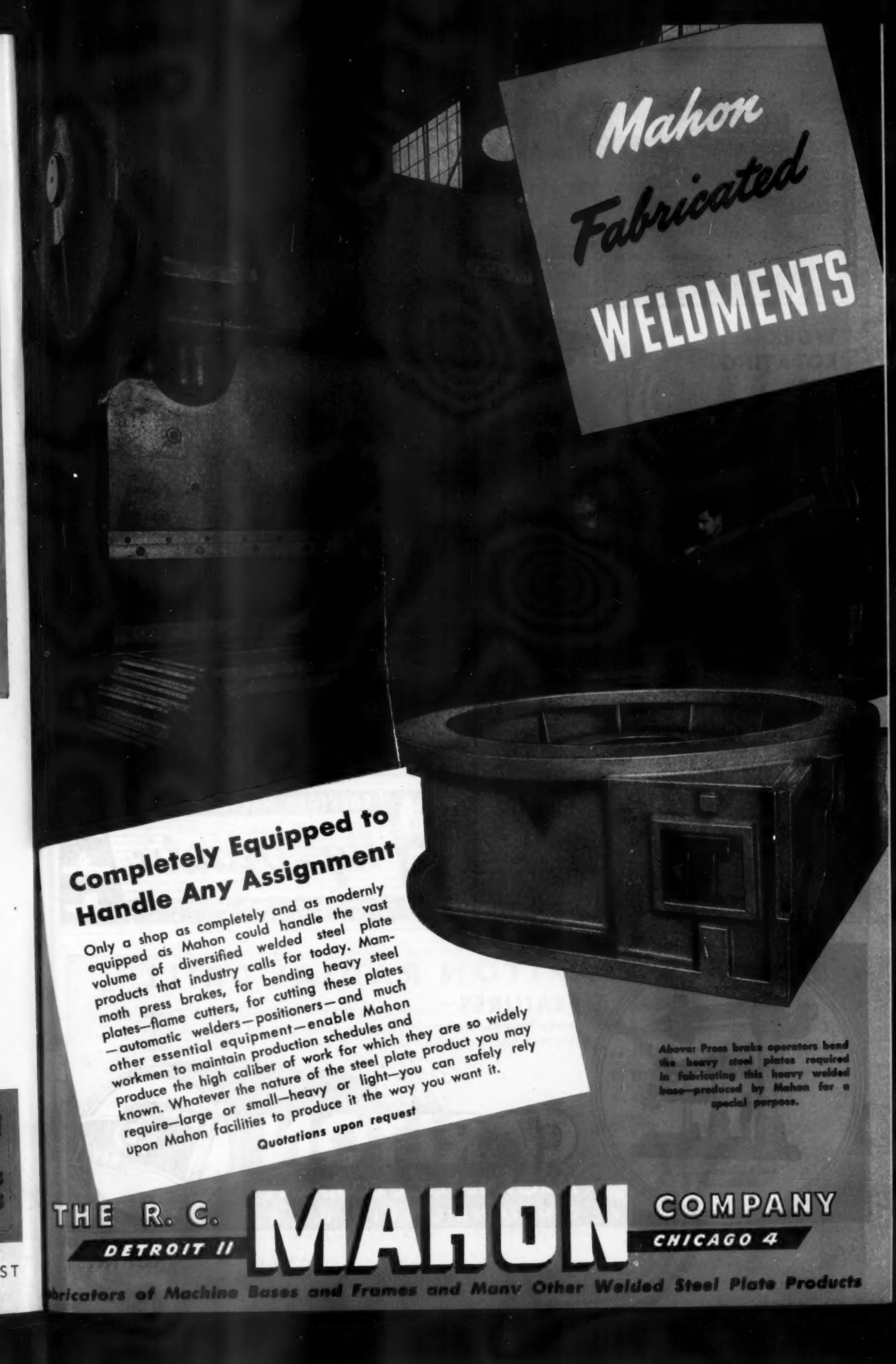
REG. U. S. PAT. OFF

POPE MACHINERY CORPORATION

ESTABLISHED 1920

261 RIVER STREET • HAVERHILL, MASSACHUSETTS

BUILDERS OF PRECISION SPINDLES



Completely Equipped to Handle Any Assignment

Only a shop as completely and as modernly equipped as Mahon could handle the vast volume of diversified welded steel plate products that industry calls for today. Mammoth press brakes, for bending heavy steel plates—flame cutters, for cutting these plates—automatic welders—positioners—and much other essential equipment—enable Mahon workmen to maintain production schedules and produce the high caliber of work for which they are so widely known. Whatever the nature of the steel plate product you may require—large or small—heavy or light—you can safely rely upon Mahon facilities to produce it the way you want it.

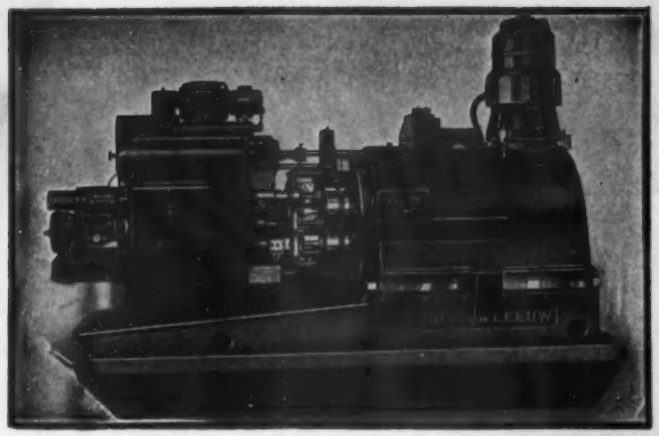
Quotations upon request

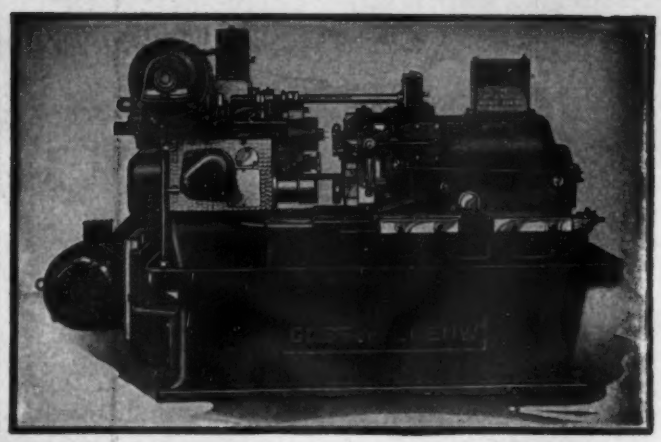
Above: Press brake operators bend the heavy steel plates required in fabricating this heavy welded base—produced by Mahon for a special purpose.

THE R. C. MAHON COMPANY

DETROIT 11 — CHICAGO 4

Fabricators of Machine Bases and Frames and Many Other Welded Steel Plate Products





WORK ROTATING TYPE

5 Spindles
6 Spindles
8 Spindles

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES

TOOL ROTATING TYPE

4 Spindles
5 Chucking Positions

On these machines, two threading operations can be handled simultaneously, each thread controlled by its own lead screw.

Among the many other modern features offered in both types are: pre-loaded anti-friction spindle bearings, hardened ways, oversize spindles and gears of chrome-nickel steel, heat-treated.

Complete details will be found in descriptive catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

ABRASIVE
ACCURACY BOOSTS PRODUCTION

No. 1G INTERNAL GRINDER
No. 34 VERTICAL SPINDLE SURFACE GRINDER
No. 1½ HAND FEED SURFACE GRINDER
No. 3B AUTOMATIC FEED SURFACE GRINDER

Look for Our Full Page Advertisements

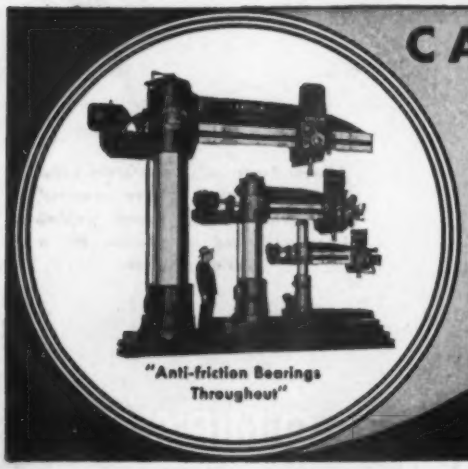
ABRASIVE MACHINE TOOL CO.
EAST PROVIDENCE 14, RHODE ISLAND

SMITH & MILLS
CRANK SHAPERS
sizes 12" to 32" stroke

THE SMITH & MILLS CO. Cincinnati, Ohio

ROCKFORD MACHINE TOOL CO.

Hy-Draulic
Shapers . . Planers . . Slotters . . Shaper-Planers
— ROCKFORD, ILLINOIS, U. S. A. —



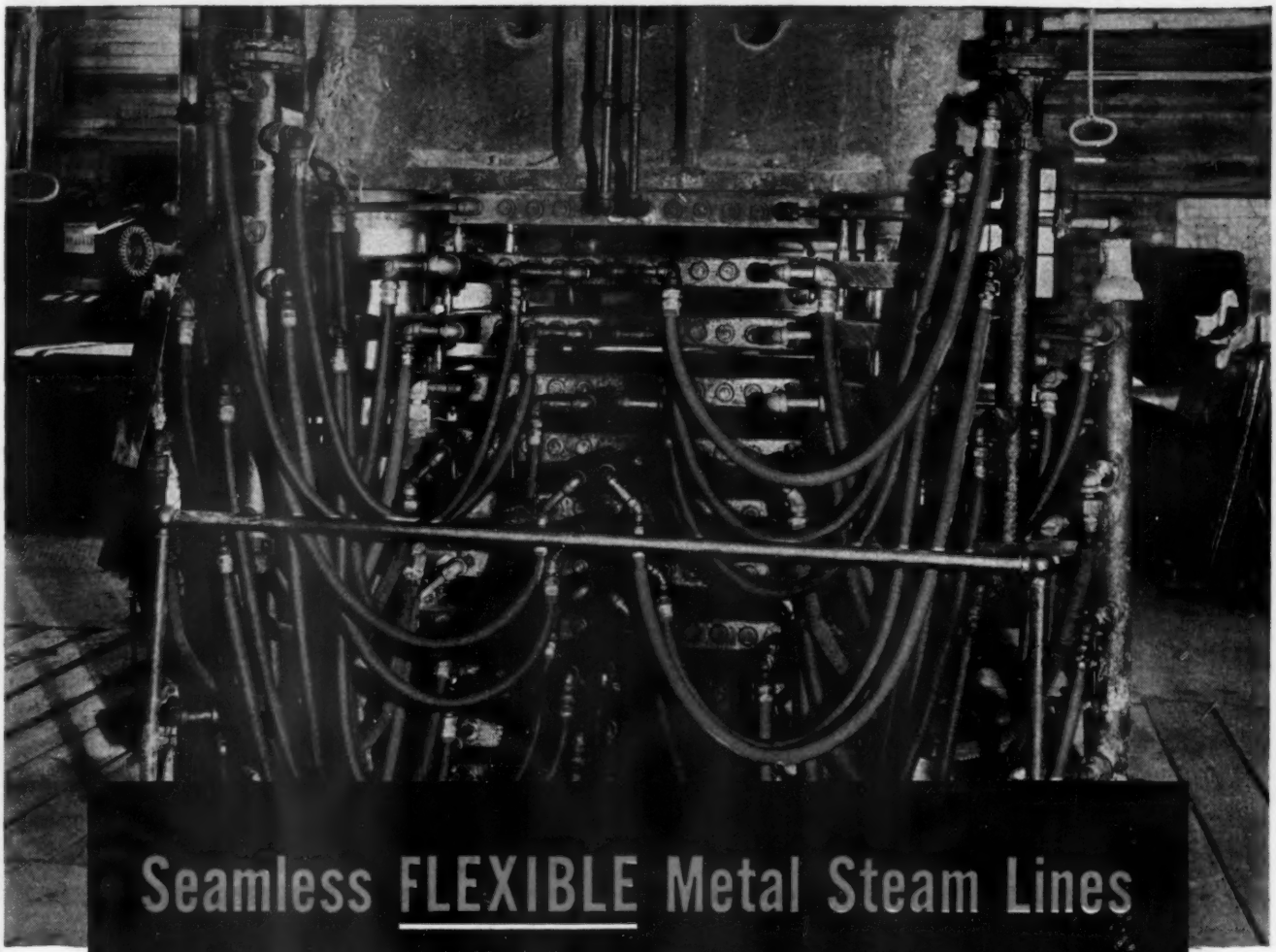
"Anti-friction Bearings Throughout"

CARLTON RADIAL DRILL

FEATURES — 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The CARLTON
MACHINE TOOL COMPANY
CINCINNATI, OHIO, U. S. A.

ARMY E NAVY



Seamless FLEXIBLE Metal Steam Lines Encased in FLEXIBLE Metal Hose

Undamaged after 7 years service

THIS PRESS for molding fiber sheets presented an unusually difficult problem in supplying steam to a multiplicity of moving parts.

Today, after seven years of heavy production without steam line failure, this manufacturer congratulates himself on having followed the advice of our Technical Department before setting up this press.

American Seamless Flexible Metal Tubing was selected for the steam lines. To meet the problem of friction or abrasion, the Seamless Tubing was encased in flexible, wear resistant American Interlocked Bronze Hose. Couplings are of brass, threaded for iron pipe connections.

If you have a problem involving the conveying of steam, air, water, oil or fuel, loading or discharging any material that will flow through a pipe, connecting moving parts or misaligned parts, isolating vibration or shielding electric wiring where the line must be flexible or resistant to abrasion, perhaps our Technical Department can be of assistance to you. Complete descriptive literature is available on request. 44195

ANACONDA

American Metal Hose

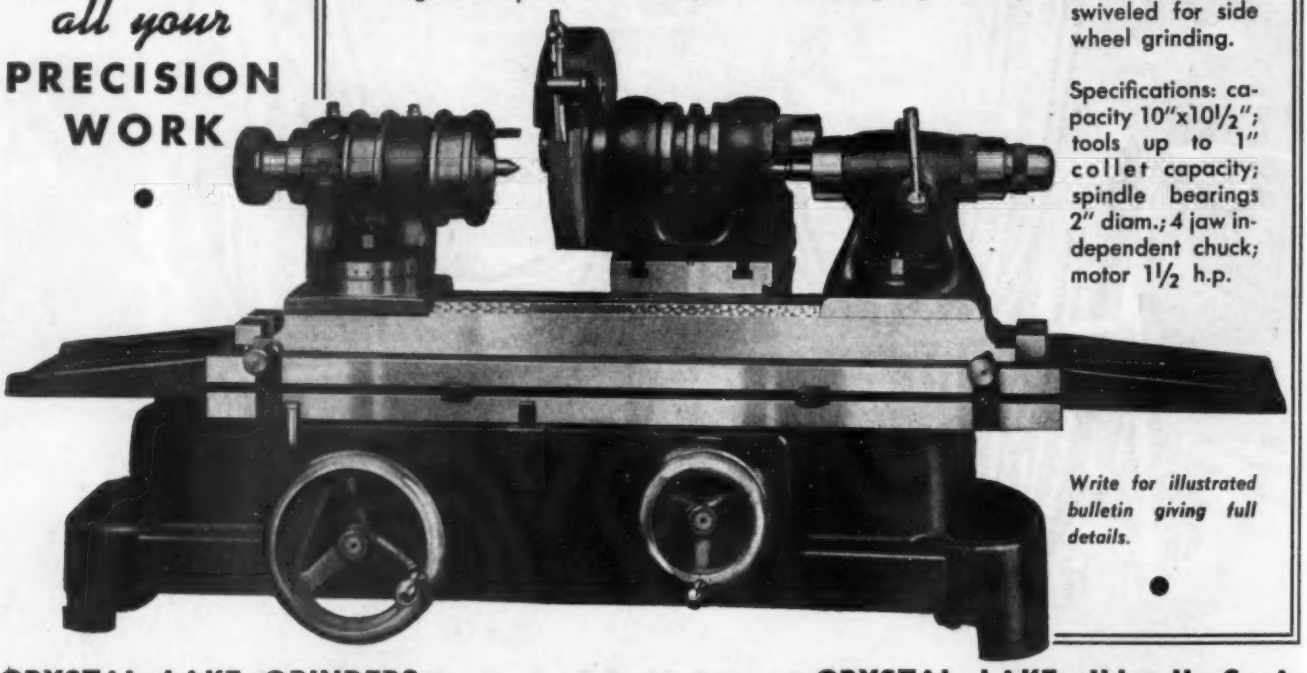
AMERICAN METAL HOSE BRANCH OF THE AMERICAN BRASS COMPANY • General Offices: Waterbury 88, Conn.
Subsidiary of Anaconda Copper Mining Company • *In Canada:* ANACONDA AMERICAN BRASS LTD., *New Toronto, Ontario*

This **BENCH GRINDER** *will handle all your* **PRECISION WORK**

THIS CRYSTAL LAKE GRINDER is a semi-universal machine of wide versatility. It is as large in size as is practical in a bench machine.

Features include: dial indicator, separate motor V-belt drive, work head swiveling through a complete 360° circle, wheel head aligning with key in plate and can be swiveled for side wheel grinding.

Specifications: capacity 10"x10½"; tools up to 1" collet capacity; spindle bearings 2" diam.; 4 jaw independent chuck; motor 1½ h.p.



Write for illustrated bulletin giving full details.

CRYSTAL LAKE GRINDERS, - - - - - - - - - CRYSTAL LAKE, ILL., U. S. A.

MANUFACTURERS OF PRECISION GRINDERS SINCE 1910

Today machine shops must be equipped to grind odd-shaped forms. To do this precisely requires dressing the abrasive wheel to the desired contour. No. 41 does that, accurately, quickly.

At Last It's Possible!

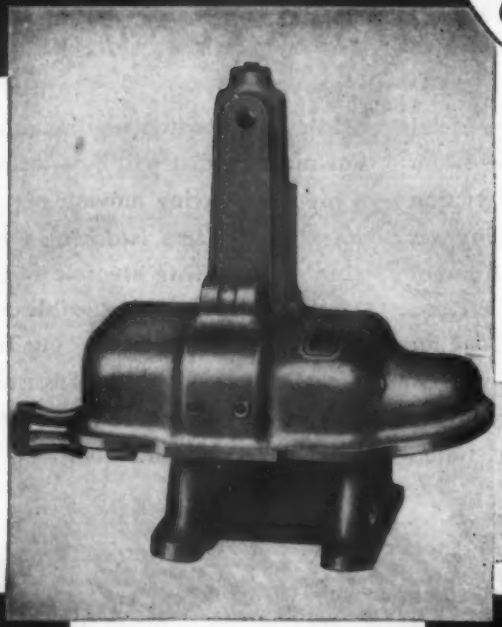
Introducing **No. 41** *Contour, Radius and Angle Dresser*

Now Even the Operator of Limited Experience Can Dress and Re-dress

ABRASIVE WHEELS

Accurately and Quickly to

ANY CONTOUR!



No. 41-B Template Dresser. Rear View.

Plus regular radius and angle Dressing

Virtually any desired contour can be generated on abrasive wheels by placing a template of the curve in the clamp of No. 41-B. A spring-activated plunger follows the contour of the template as the operator simply turns the knob. As he turns it, the chisel pointed diamond of the dresser moves across the face of the rotating abrasive wheel, dressing it exactly to the shape of the template.

Flexibility, accessibility of parts for cleaning, and simplicity are among the features of No. 41-A Radius and Angle Dresser made possible by expert engineering design.

With its base, No. 41-A does all the usual jobs of a quality radius and angle dresser. Yet its cost is remarkably low.

No. 41-A Radius and Angle Dresser. Front View.

After the wheel is dressed by the chisel-pointed diamond, it fits the template accurately. When worn, it is quickly re-dressed to the same contour.

Limited Territories Open

Write for Booklet D

BEST TOOLS CORPORATION

ROCKVILLE CENTER, LONG ISLAND, N. Y.

Have you ever tried to saw a slot in a piece of slate? Slate manufacturers do it every day—slots, notches and angled corners. Recently a great deal of slate has been used for blackboards at air bases and for shower stalls in Army and Navy training camps.

Because much of the slate cutting is not on a mass production scale, it must be done by hand. It takes a mighty good hack saw blade to do the job. Disston was the first to develop a blade which would cut this highly abrasive material successfully in thicknesses from ¼ inch up to 4 inches.

Time after time, it's Disston skill and Disston steel that finally solve the toughest cutting problems. Whether it's a special knife for cutting sugar beets or a special file for the blades of a giant turbine, the ingenious engineers of Disston find the answer.

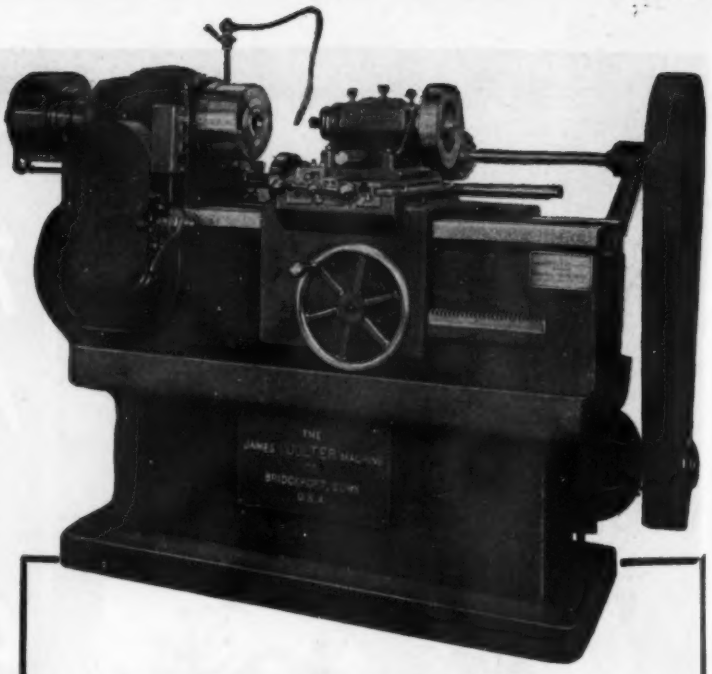
It's this kind of knowledge, experience and skill with steel that makes Disston *standard* tools superior. Does *your* problem involve hack saw blades, or files—circular saws or band saws—wood-cutting or metal-cutting—or the sawing of some odd material like slate or synthetics? You'll do well to discuss it with Disston. Write to Henry Disston & Sons, Inc., 620 Tacony, Philadelphia 35, Pa., U. S. A.

ESTABLISHED 1840
REG. U.S. PAT. OFF.

DISSTON

Conserve Man-Minutes and help win the war

Keep Ahead of DEFENSE DEMANDS on the PRODUCTION of EXTERNAL and INTERNAL THREADS



The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.

Send for Descriptive Bulletin giving full information.

The James COULTER Machine Co.

BRIDGEPORT • CONNECTICUT • U.S.A.

LEACH External Grinder

Price reduction made possible by increased production.

PRICE

~~$985.00~~

$875.00

Fully Equipped

Our dealers will help you fill out necessity priority forms.

Write us today for your nearest dealer's name and address.

Grinds Work from ¾" to 11" in length and from ⅛" to 7" in diameter.

Send for Descriptive Literature

EXCELLENT DELIVERIES

Exclusive Selling Agents

H. LEACH MACHINERY CO.

387 CHARLES ST. PROVIDENCE, R. I.

Agents in all Principal Cities Throughout the World

The Machine of Tomorrow— TODAY!

Modern Functional Design Throughout

Neoprene Insulated

Famous Gold Seal Spindle

Electrically-Operated Diamond Wheel Dresser

Sav-way SPITFIRE

ELECTRO-HYDRAULIC INTERNAL GRINDER

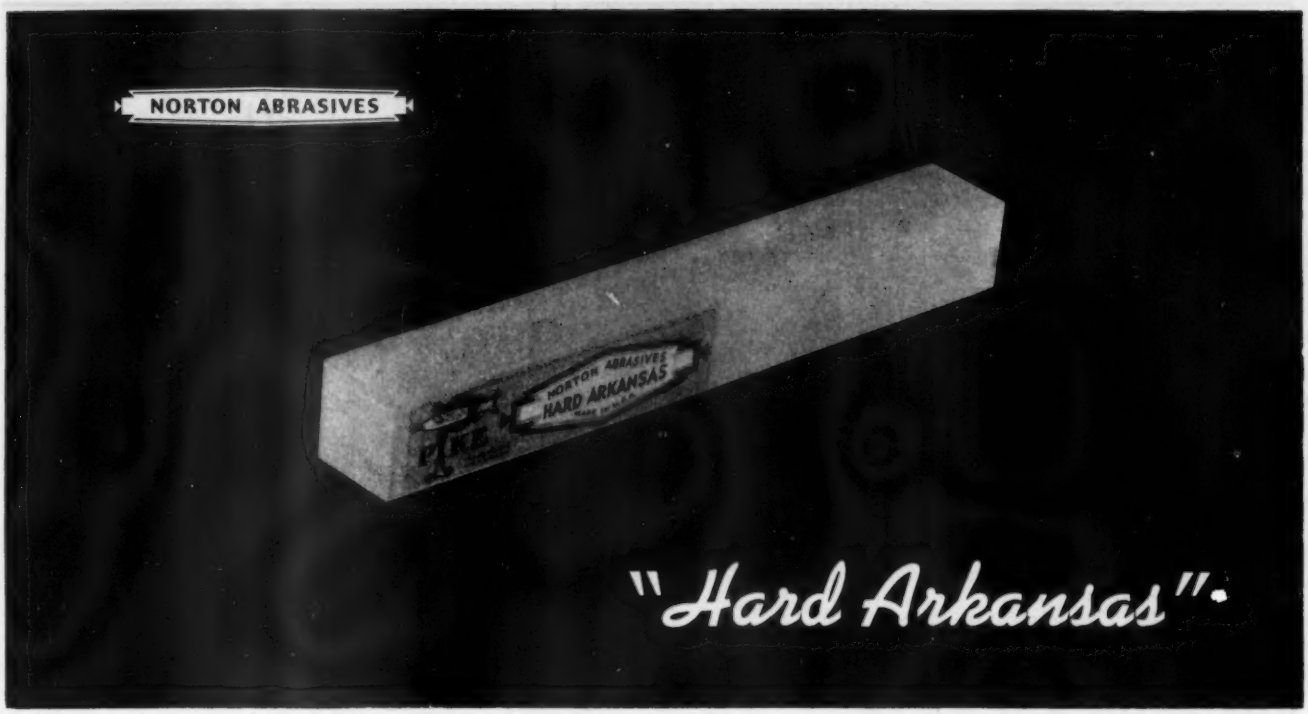
Ready ahead of time—the Sav-Way MH-1 combination hand and electro-hydraulic internal grinder. 5/32" minimum table stroke! Gatling gun table speed through the use of aircraft-type micro-limit switches and solenoid-operated valves. Electrical, automatic, adjustable cross feed. Dozens of outstanding features! It's a post-war machine—ready now to help speed today's war production! Its low cost will surprise you.

Send for Illustrated Literature

Sav-way INDUSTRIES • DETROIT

Machine Tool Division

Sav-Way Industries, Box 117, Harper Station, Detroit 13, Mich.



That little oilstone, only three and a half inches long and one half inch square, costing 70 cents, is certainly earning its keep . . .

The Job: Machining to size, a boss on a magnesium casting. Cut .150 on first side, .250 on the opposite side; 24 hour continuous operation.

The Report: "With regular grinding, 67 parts were machined before failure of the milling cutter. We then stoned the same cutter by hand with a 'Hard Arkansas.' This increased production to 280 parts."

(Multiply that by the numbers of your machine cutters.)

"Hard Arkansas" is a natural stone from the Ozark Mountains, white as alabaster and unapproached in its faculty of imparting superfine edges.

For other hand-stoning jobs India Oilstones (aluminum oxide) are available in three grits and, like the Hard Arkansas, in hundreds of shapes and sizes.

Personal service by our Field Engineers and by the able men of our many Industrial Distributors merely awaits your call.

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(DIVISION OF NORTON COMPANY)
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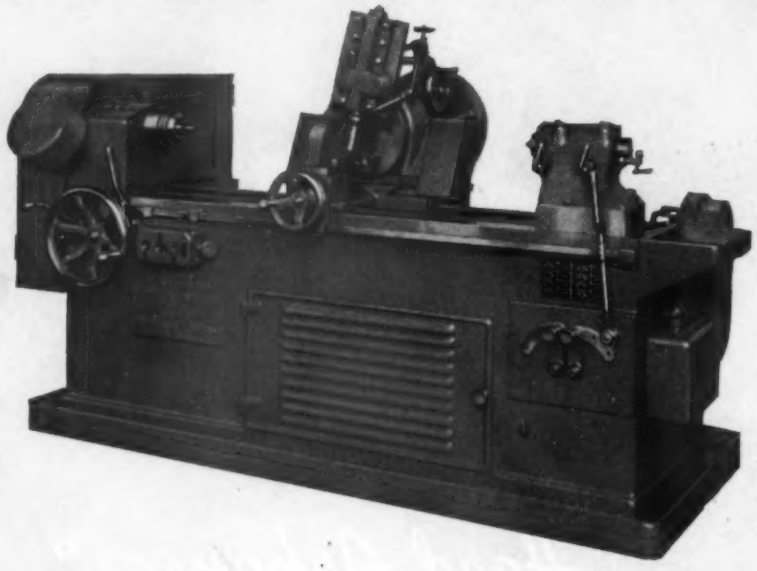
BRANCHES: Boston, Buffalo, Chicago, Cleveland, Cincinnati, Grand Rapids, High Point, Indianapolis, Detroit, Los Angeles, New York, San Francisco, Philadelphia, St. Louis, Tacoma.



The ADAMS Gear Hobber and Thread Miller

The Adams Manufacturing Hobber is available when there is a sufficient volume of splined shaft and spur gear hobbing to warrant the purchase of equipment for these operations only.

Here is a machine that combines precision with versatility. It hobs multiple splined shafts, spur gears and helical gears, and it will mill worm and screw threads.

THE ADAMS COMPANY

1905 BRIDGE STREET
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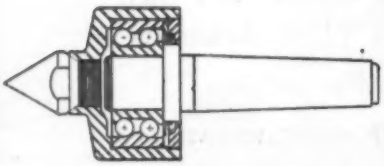
1883 — Our 61st Year — 1944



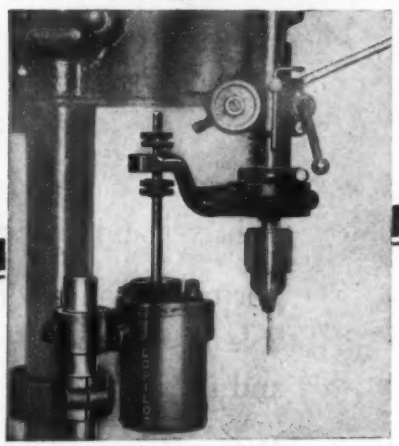
SHORT OVERHANG

and accurate — at all speeds — *because* of short overhang and preloaded ball bearing. Point ground after assembly assures true center point.

Write for Catalog A-44

THE READY TOOL COMPANY
Iranistan & Railroad Aves.
BRIDGEPORT, CONN.

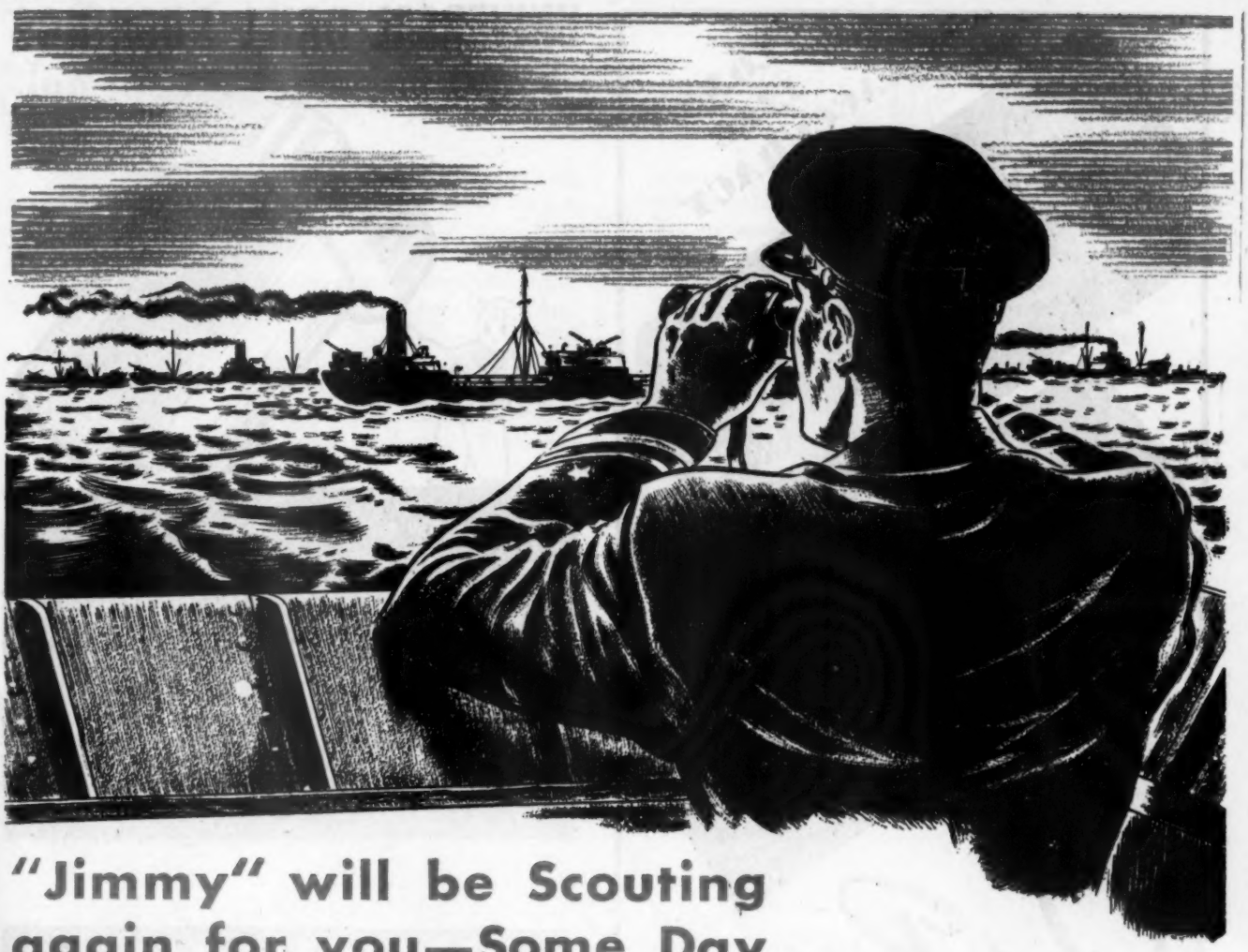
COPILOT DRILL PRESS FEED REGULATOR



Easily and quickly attached to hand feed drill presses, it enables TOTALLY INEXPERIENCED and UNSKILLED OPERATORS to produce good work from the START at maximum possible rate of production consistent with acceptable work, and with minimum drill breakage. It positively prevents violent contact of drill with work and prevents dropping of spindle when drill breaks through. It minimizes fatigue and nervous tension in small hole drilling. It operates on the hydraulic principle and is self-lubricated. Its metering valve automatically clears itself, cannot clog, and is not accessible to the operator. No checking of upward motion.

For full details write immediately to

Special Devices COMPANY
Berlin, Conn.



"Jimmy" will be Scouting again for you—Some Day

You recall "Jimmy," of course—that up-and-coming salesman of your Industrial Supply Distributor's who always went his rounds with eyes open for emergency materials he knew you were needing. Many times he found them, too—enough to keep you going until your next regular shipment reached your Distributor from the factory.

"Jimmy" still is a good scout—for you and for us all. Today he is helping to keep the sea-lanes clear but some day he'll be back again to his old job. You will be needing your Distributor then, too—and will appreciate Jimmy's cheerful help all the more.

And meantime—your Industrial Supply Distributor is doing a swell job in spite of handicaps of men and materials shortages—he's working night and day to keep the things you must have, moving in on schedule.

Help your Distributor to help you by ordering as far ahead as you can. He probably can send what you need from stock—or already has it coming in. It saves your time—it helps keep your production rolling at top schedules—to

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Universal Drill Bushings save valuable tool drills on a wide variety of applications. Because they are straight and round and have superfinished bores, Universal Drill Bushings insure accuracy and possess unexcelled wearing qualities. It will pay you to use these tough, precision-made bushings. Write today for catalog.

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DIAMONDS for Victory

New!

HANDL-NIB

(Trademark Reg.)

RE-SET-ABLE DOUBLE DUTY DIAMOND DRESSER

Ejector Rod

2 TOOLS For the PRICE of ONE

Heavy Duty Tool with 7/16" shank "BIG-HED-NIB" Interchangeable For MACHINE or HAND TOOL DRESSING

This new DTCo "HANDL-NIB" easily dresses wheel faces up to 2" wide with a single rotation of the wrist. Patents pending.

—DETACHMENT INSTRUCTIONS—

For separate use of "BIG-HED-NIB" in adaptor on machine simply tap on ejector rod to release nib from "HAND-NIB" holder.

Can be returned to handle in a jiffy for hand dressing.

Supplied Free when requested with orders for RE-SET-ABLE LOC-KEY-SET BIG-HED-NIBS of 2 carats or over.

Three grades of diamonds. Common quality $12 per carat. Medium quality $24 per carat. Select quality $48 per carat.

"For a New Front" buy RE-SET-ABLE

DIAMOND TOOL COMPANY Not Inc. - - - 942 E. 41st Street

SHELDON M. BOOTH, President CHICAGO 15, ILL.

Blue Flash Snagging Wheels Never Raise the White Flag

EXAMINE any of Bay State's Blue Flash Snagging Wheels and you'll understand why there isn't a job too rough or tough for them.

Bay State's special resinoid and vitrified bonds give them "guts" . . . the extra strength to stand up longer under severe use, hold their shape, and cut cooler.

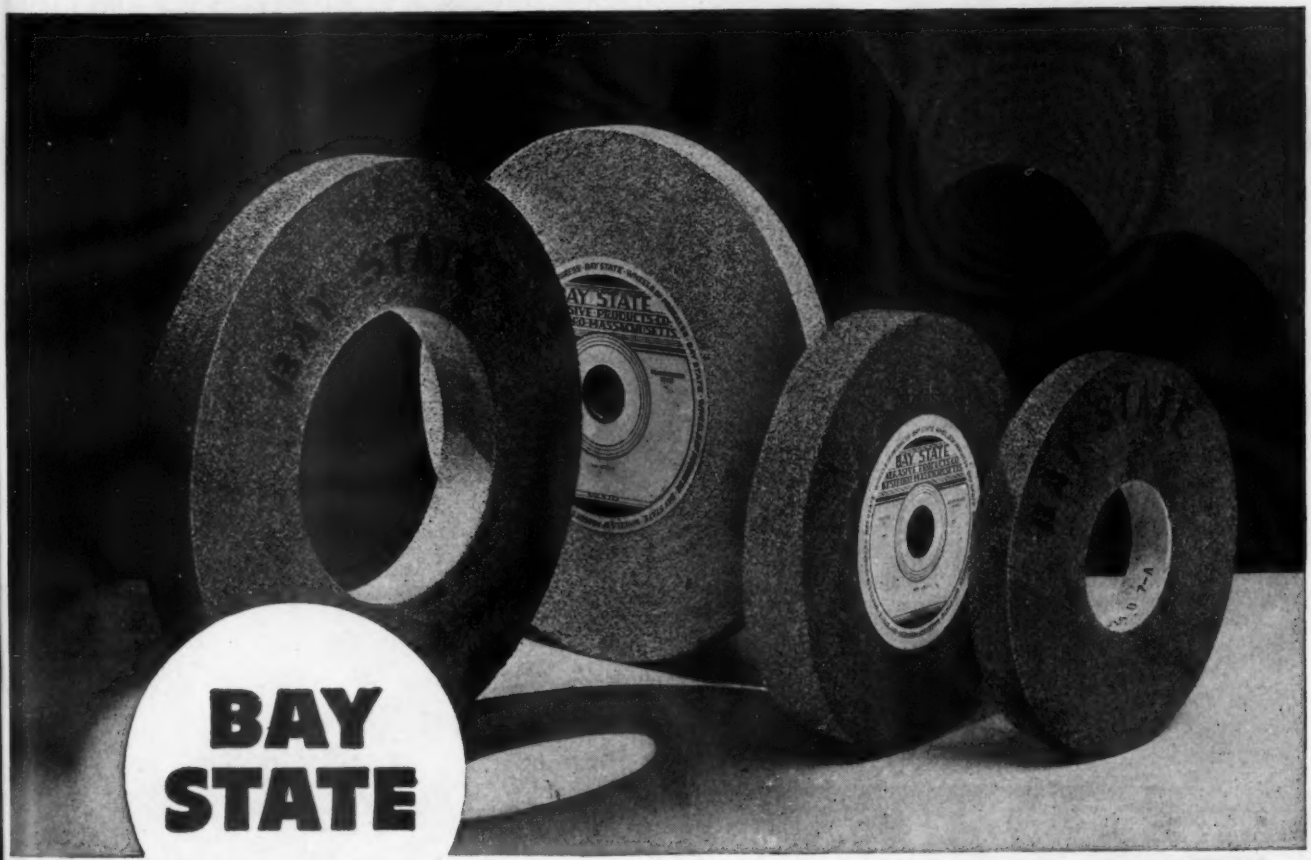
Bay State's controlled porosity, available in several different degrees, means that you can "fit the grade to the grind" more accurately to obtain faster and more economical production. These are basic advantages.

Now consider these special advantages . . .

1. portable snagging wheels with threaded nuts securely anchored in the wheel back . . . a unique manufacturing feature.
2. double purpose resinoid wheels for both high speed floor stand and swing frame use . . . a wheel within a wheel.
   For instance, it is possible to produce resinoid bonded wheels 30″ x 3″ x 12″ with the first 6″ of the diameter in an abrasive combination best suited for high speed floor stand snagging. When reduced to a 24″ diameter, another accurately suited resinoid specification is then available for the generally more severe swing frame grinding requirements.

If you are not using Blue Flash Snagging Wheels now, try them. Call in a Bay State engineer to help you choose those best suited for your particular work. See for yourself why Blue Flash Snagging Wheels never raise the white flag. Send for Bulletin B for additional details.

BAY STATE ABRASIVE PRODUCTS CO.
WESTBORO, MASS.



BLUE FLASH GRINDING WHEELS *FAST and COOL*

GRINDING WHEELS · HONING AND SUPERFINISHING STONES · PORTABLE SNAGGING WHEELS
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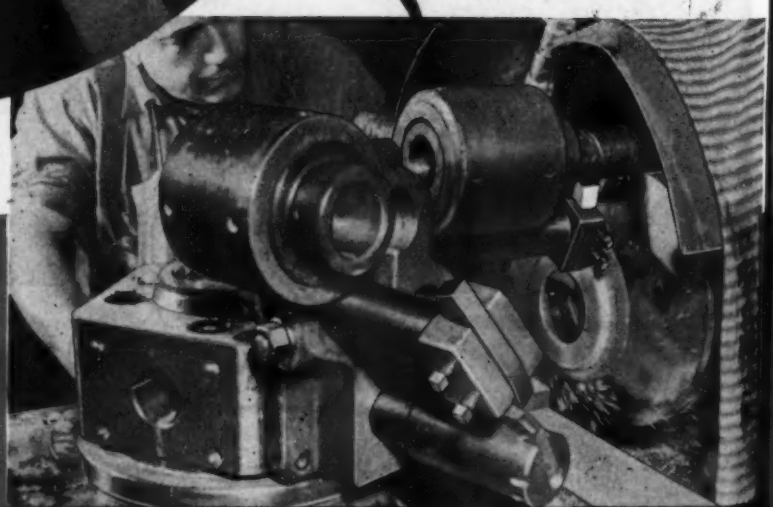
'STANDARDS' are "TOPS" for

Standard CARBOLOY General Purpose Tools

AVAILABLE FROM STOCK IN 10 STYLES—5 GRADES AND ALL COMMON SIZES



Machining time reduced, tool life increased, hand polishing time cut 80%, on this steel aircraft gear. Typical of the many benefits of standard Carboloy Tool use.

60%-80% of Your TURNING BORING, FACING

USE OF Standard Carboloy Tools has swiftly spread since their introduction until today practically every major war plant machining metals now uses "standards" to step up production and step down costs. Here's why:

Standard Carboloy Tools are top quality carbide tools at prices generally comparable to other cutting materials. Designed in 10 standard styles adaptable to 60% to 80% of all single point turning, facing and boring work. When required, these "standards" can be quickly ground to many special shapes and put on the job *fast*. Eliminates need for large, complicated stocks of "specials". Permits minimum tool inventories. Simplifies handling and ordering. Can be converted readily to peacetime production.

Specify *Standard* Carboloy Tools for top performance, top economy. 10 styles, 5 grades, wide range of sizes—for cutting steel, cast iron, non-ferrous and non-metallics. In stock for prompt delivery. Write for new catalog GT-175.

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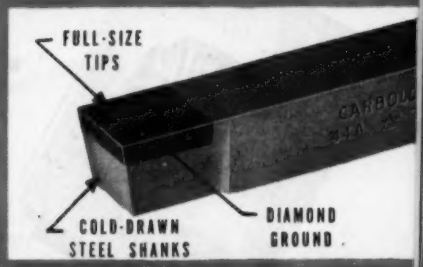
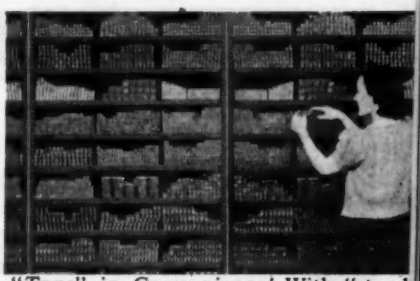


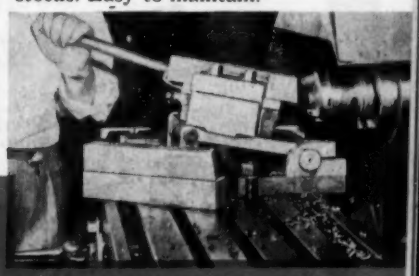
"Tops" in Quality! Full size tips, diamond ground cutting edges, cold-drawn steel shanks, are among the "top-quality" features of Standard Carboloy Tools.



"Tops" in Convenience! With "standards", the bulk of your requirements can be met from just 10 styles. Simplified stocks. Easy to maintain.

For "Emergency" Tooling! Keep a stock of Standard Carboloy Blanks. Quickly torch braze to your shanks and get tools on the job fast.

"Quickly Adapted!" With Standard Carboloy Tools in your crib you can quickly adapt to special shapes by rapid grinding. Training film available.



"Tops" in Economy! Modern "mass production" methods bring you high quality Carboloy Tools at prices generally comparable to other cutting tools.

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TUNGSTEN CARBIDES ★ ★ ★ TUNGSTEN CARBIDES WITH TANTALUM AND/OR TITANIUM CARBIDES

INGENIOUS NEW PRINCIPLE

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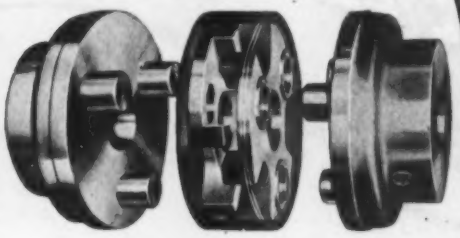
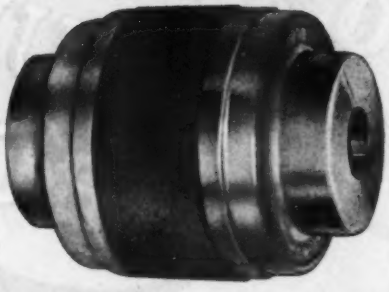
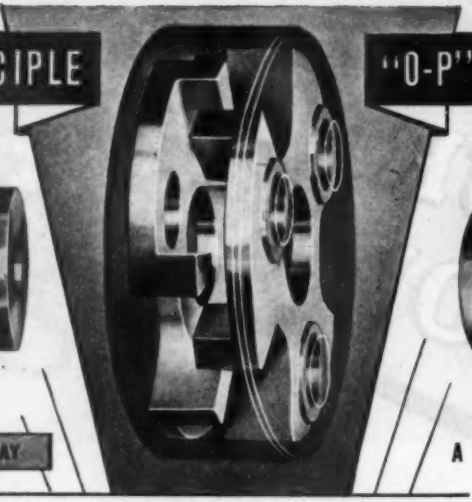


PATENT NO. 2271988

"O-P" MULTIFLEX COUPLINGS



A MASTER-PIECE FOR PRODUCTION



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Our achievement of this ingenious new principle in a MULTIFLEX COUPLING required several years to perfect. Today war production calls for twenty four hour service on all machines — they must be kept going — and the transmission of power becomes a most vital factor. MULTIFLEX COUPLINGS were designed to transmit that power under all conditions. MULTIFLEX COUPLINGS give greater MULTIFLEXIBILITY against heavy shock and pulsating loads in any direction, also compensating for ANGULAR and PARALLEL MISALIGNMENT. So — for insured production order MULTIFLEX COUPLINGS.

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REMOVING QUENCHING OIL SPEEDILY, EASILY

Before heat-treated parts are ready for grinding, machining, inspection, assembly or other operation, they must be rid of all quenching or tempering oil.

Because of the tenacious adhesion of the oil film to be removed, specialized Oakite methods have been developed that will HELP YOU do this work MORE THOROUGHLY and EASILY . . . that SAVE TIME in preparing parts for subsequent finishing. Write today for details.

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GET bulletin on the improved Wayne Collet Chucking Fixture using the same unique jaw principle but now made for AIR or hand operation. Easily convertible from one to the other any time. The ideal tool for assembly work and general machine tool use. Quick, firm grip, instantaneous release. Automatic valve control leaves both hands free. Many other features. Write!

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MORE SURFACE GRINDING

GRINDING TIME REDUCED to 15% of Former Standard!

The proof piles up—through actual War Production Test Runs in busy plants . . . and Cortland Chucks and Segments are winning with outstanding performance.

For instance: A Production Test on a Blanchard No. 18 Vertical Surface Grinder by a manufacturer of filing machines and band saws. Wheel speed 705 R.P.M.

WORK: Saw tables for Vertical Band Saw Machines —close grained gray iron, not machined before grinding; 547.49 sq. in. top side; 1 piece per table load.

Here are the amazing Production Test facts—showing how Cortland Chucks and *Diagonal Shearing* Segments beat another brand by more than 6 to 1 in grinding performance.

Detail	CORTLAND Chuck and Segments	*Competitive Brand of Sectored Cylinder*
Cubic inches of stock removed per inch in height of segments	418.81	38.12
Ampere readings	50	75 to 100
Dressings necessary	None	1
Work heat?	No	No
Grinding time	79 secs.	528 secs.

In addition to the great saving in grinding time, 6½ times more stock was removed by Cortland Chuck and Segments per unit height of abrasive.

Why not find out how Cortland Chucks and *Diagonal Shearing* Segments can increase the quality and quantity of your grinding output? Write for latest illustrated bulletin giving complete story of Cortland performance.

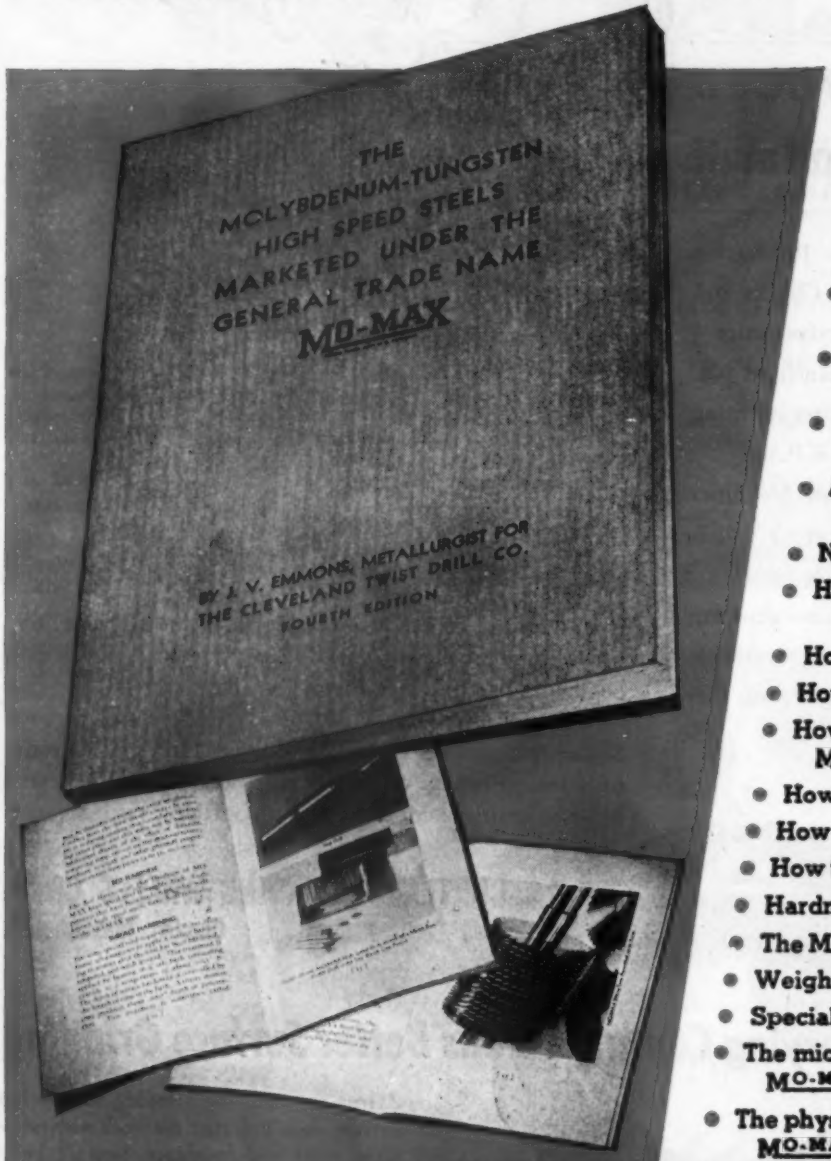
CORTLAND GRINDING WHEELS CORP.
5 Cortland Street Chester, Massachusetts

Diagonal Shearing with Varying Contact Means Better Surface Grinding

A true segment, the grinding surface has narrow ends that *start* the work with minimum shock and resistance. Straight inner edge of segment passes diagonally across work with a *shearing* action that *cuts* and *removes* the metal. Varying contact area insures longer exposure to coolant—decreases heat—reduces segment wear—conserves power.

CORTLAND
Chucks and Segments

Send for YOUR copy of this new technical data book!



This new, revised illustrated handbook gives you the up-to-date story of the applications of MO-MAX High Speed Steel — the steel that has proved itself superior for cutting tools. From the factual information it contains, you'll understand why tool manufacturers and others are specifying MO-MAX.

This booklet will answer quickly and clearly the questions you'll naturally ask. To get a copy, simply fill out and mail the coupon. This valuable reference book includes—

- Why and How MO-MAX was developed
- Standard composition of MO-MAX
- Carbon ranges for special purposes
- Actual examples of tool performance
- New applications of MO-MAX
- How to select MO-MAX for your job
- How to forge MO-MAX
- How to anneal MO-MAX
- How to weld and braze MO-MAX
- How to heat treat MO-MAX
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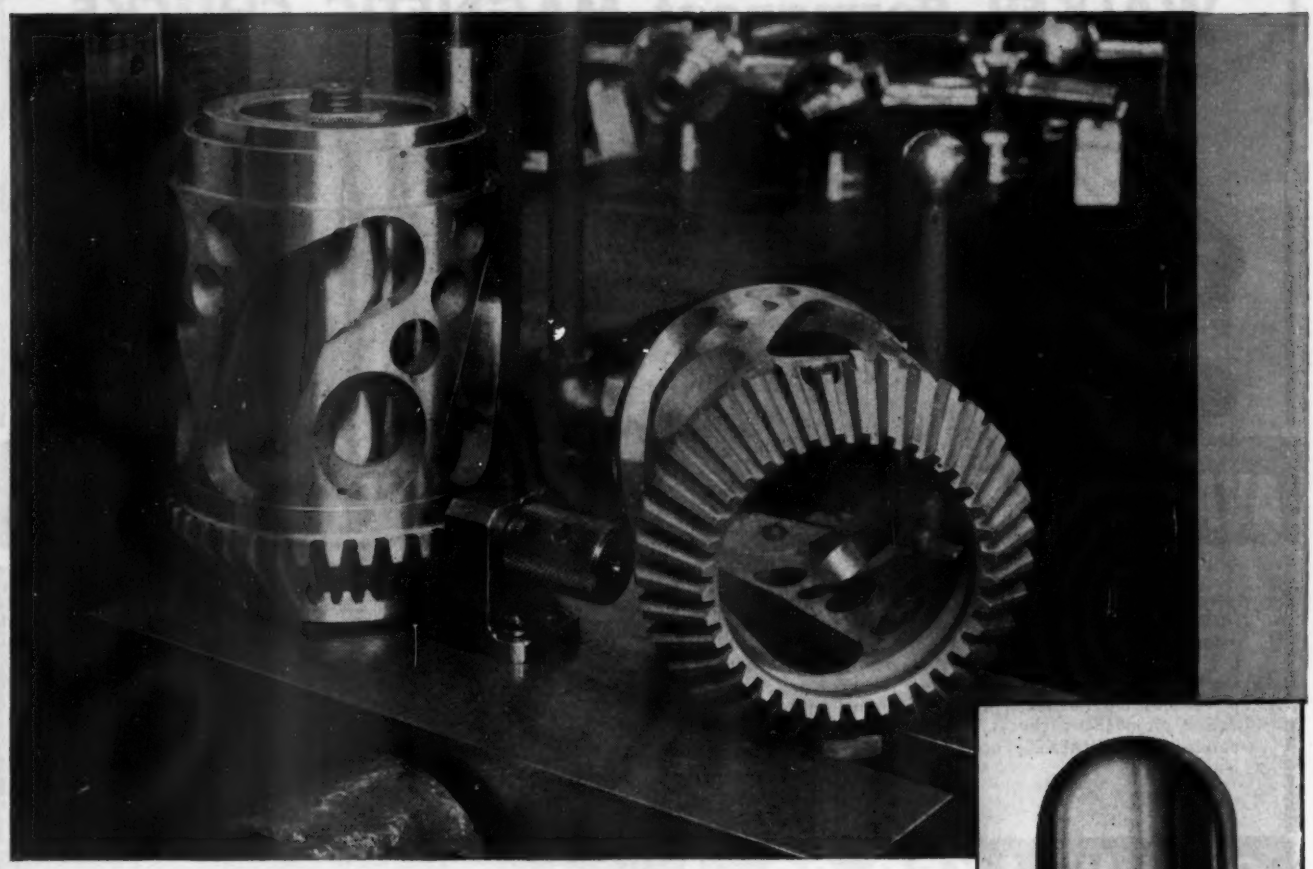
"Mohican"	Atlas Steels, Ltd.	"Rex-T-Mo"	Holcomb Steel Co.
"Bethlehem HM"	Bethlehem Steel Company	"Mogul"	Jessop Steel Company
"Mo-Cut"	Braeburn Alloy Steel Corp.	"Tatmo"	Latrobe Electric Steel Co.
"Star Max"	Carpenter Steel Co.	"S. T. M."	Simonds Saw and Steel Co.
"Molite 8"	Columbia Tool Steel Company	"Mo-Tung"	Universal-Cyclops Steel Corp.
"Rex-T-Mo"	Crucible Steel Co. of America	"Vul-Mo"	Vulcan Crucible Steel Co.



A Typical Problem

SOLVED BY BROACHING

Many years ago broaching took over the problem of mass production and solved it. Today a much more difficult problem is also finding a solution by broaching. It is the problem of maintaining excessively close tolerances and still using mass production methods.

This is a typical problem — to make a cut on the Cam lug stop for the Hydromatic propeller to a plus or minus .001 and still keep up mass production. With the help of Hamilton Standard engineers, an entirely new idea was evolved whereby guide fingers locked the fixture and broach body in constant alignment in spite of slight slide torque, broach wear or uneven cutting pressure. Tolerances well within limits have been consistently maintained.

One of the greatest aids to modern aviation is the Variable Pitch Hydromatic Propeller whose barrel and cam set-up is shown above.

ARMY E NAVY

The LAPOINTE Machine Tool Company

HUDSON, MASSACHUSETTS, U. S. A.

MANUFACTURERS OF BROACHES AND BROACHING MACHINES

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AVAILABLE FOR QUICK SHIPMENT IN SEVERAL SIZES

THESE new chucks—of greater holding power and with more effective magnetic area for a given size—are WALKER'S contribution to immediate and future needs of the metal working industry. Greater magnetic area—only 3/8" between Pole Centers. Top Plate Area totally magnetic. This contributes to machine efficiency—more parts per table load. These improvements are the result of over 50 years experience in the design of magnetic chucks. A unique method of energizing, developed by WALKER, assures retention of holding power indefinitely.

WALKER Permanent Magnetic Chucks, like the regular line of WALKER Electro-Magnetic Chucks which the new line supplements—can be depended on for secure holding of a wide range of work as well as faster set up, greater production and utmost protection of the work from marring and spoilage due to the holding means.

Of WALKER quality throughout, the new Permanent Magnetic Chucks are available for immediate shipment in standard sizes. Special adaptations can be developed promptly for unusual work requirements.

Get all details now. Call on WALKER engineers to help you solve your chucking problems.

O. S. WALKER CO., Inc., WORCESTER, MASS., U. S. A.

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Here is a really fine tool room tool holder that soon pays for itself because of advanced design details.

Each holder holds three sizes of bits—each bit may be held in four positions—the holder grips the tool with a wide, immovable grip. Write today for descriptive folder.

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For half a century, The Cleveland Pneumatic Tool Company has devoted itself to serving many major industries.* Skilled technicians and experienced engineers within our organization have pioneered and perfected many products for each of these fields. Thus initiative and resourcefulness have enabled us to keep abreast of this country's remarkable industrial progress . . . We are commemorating our golden anniversary by continuing to put all our talents and energies in the fight to preserve the American way of life. We are proud to have grown with our nation for 50 years, and look forward to serving in the great future that lies ahead.

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**CLECO Pneumatic Tools speed production in metal-working plants. AEROLS (the shock absorbing landing gear used so universally on aircraft) insure safe, smooth landings and take-offs. CLEVELAND Rock Drills are widely used in the mining and contracting fields. CLE-AIR Shock Absorbers protect buses, trucks and trailers from road shocks.*

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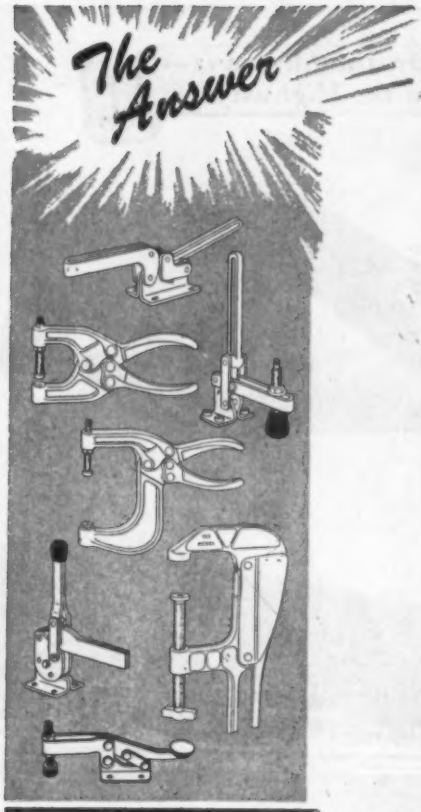

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—where all our activities are devoted to the engineering and building of clamping devices exclusively.

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4328 SAN FERNANDO ROAD, GLENDALE, CAL.

Investigate

THE POSSIBILITIES OF THE NATIONAL KEYSEATING MILLER on Your Work

• Shops all over the country are solving difficult keyseating problems by chucking this attachment on their drill presses, radials and horizontal boring mills—and milling keyseats in pieces too large or bulky for convenient handling on keyseating machines.

The "National" goes through the hole once and mills keyseats with parallel sides and parallel with the axis of the bore. It's a big time and money saver and is available in standard stock diameters from ½" to 3½" for cutting lengths from 1⅞" to 12". It will keyseat in blind holes, taper holes, and offset holes. We also manufacture oil-grooving millers.

WRITE today for Catalog No. 15

Several widths of cutters can be used with each size miller and many different hole diameters keyseated with one tool through the use of eccentric bushings.

NATIONAL MACHINE TOOL CO.
CINCINNATI, OHIO

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

MITTS & MERRILL
913 Tilden St.
Saginaw, Michigan

Giant KEYSEATERS

HOLMAN

BETTER, FASTER HOLE FINISHING

HELICAL TAPER PIN REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

HOLMAN REAMER CO.
MANCHESTER, CONN.

SAVE TIME with NICHOLSON

E-X-P-A-N-D-I-N-G MANDRELS

You also PROMOTE PRECISION when you equip your shop with these economy tools for holding work while being machined. Hardened tool steel; precision ground.

2 types, all sizes; singly or sets. Prompt delivery. Bulletin 1043.

Other Products: Arbor Presses, Control Valves, Steam Traps, etc.

W. H. NICHOLSON & CO.
114 OREGON ST., WILKES-BARRE, PA.

KINKS FROM GEOMETRIC

ON HOW TO SAVE PRECIOUS CHASERS

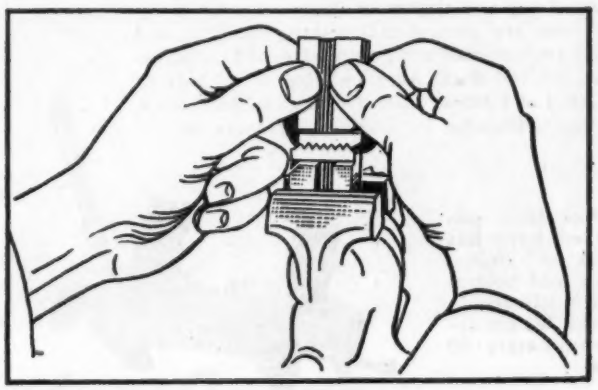
...AND GET BETTER THREADING!

don't spoil threading jobs by using chasers that "shave".★

★ Meaning that one or more of the chasers in the set are not tracking or following exactly in the groove cut by the preceding chaser or chasers, and are consequently shaving off the side walls of the thread, making it thin and of poor form.

The Geometric Tool Company is listed on the Treasury Department's Roll of Honor of those companies whose employees contribute at least 10% of their earnings, through the Payroll Savings Plan, for War Bonds. A War Bond is a share in the future!

do lap the chasers that shave, slightly dulling the cutting edges of the offending teeth so chaser will be forced into line with others of the set.★



★ HOW TO LAP CHASERS THAT SHAVE

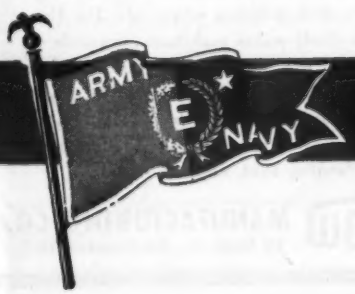
(This method applies to milled chasers only.)

1. Identify the offending chaser or chasers by looking for frosting (bright narrow band) on cutting face along front or back edges of teeth.

2. Grip a good chaser in a vise with threads of chaser up, hold imperfect chaser between fingers and start lapping. Use fine emery or carborundum. Upper chaser should be forced sidewise or twisted slightly so as to lap sides of teeth that show frosting. It should be tipped slightly so that lapping will not be carried across full width of land but only along cutting edge.

3. Remove frosting from cutting face of chasers with oil stone before further testing of chasers. If frosting again appears, lapping must be continued. Amount of lapping depends upon how badly the chasers have been shaving.

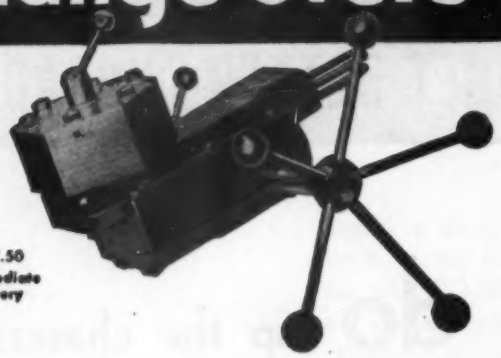
THE GEOMETRIC TOOL COMPANY
NEW HAVEN 15, CONNECTICUT



GEOMETRIC

SELF-OPENING DIE HEADS
COLLAPSING TAPS
CHASER GRINDING MACHINES
SOLID ADJUSTABLE DIE HEADS
SOLID ADJUSTABLE TAPS
THREADING MACHINES

for QUICK change-overs



$197.50
Immediate Delivery

UTILITY TOOLS

In a matter of minutes you can convert your engine lathes into screw machines. Simply remove tail stock and install a Utility Turret and Crossfeed Cut-off. Turret has rack and pinion which assures steady feed. Raised bearing surface eliminates all chip trouble. Has two taper gibs for take-up and alignment. All ways and bearing surfaces are ground. All inserts, bushings and pins are hardened and ground. Hex is 5⅛" across flat, 2-7/16" thick. Accommodates a ¾" hole or a No. 1 or 2 Morse taper. Fits Logan, South Bend, Atlas, Craftsman, 10" Sheldon, Clausing, etc.

Cross Slide pictured here has rack and pinion, two tool holders with adjustable jacks. Weight approximately 40 lbs.

$55.00

Collet Closer parts are hardened and ground. Full ball bearing. Only wear is on ball bearings. Write for detailed literature.

$60.60

UTILITY TOOL and DIE MFRS.

1370 West Washington Blvd.
LOS ANGELES 7, CALIFORNIA

FOR QUICKER
Grinding, Sanding, Drilling, Buffing...
Take the TOOL TO THE JOB!

STOW
FLEXIBLE SHAFT MACHINES

...Save Effort

...Speed Output

Stow Mobile Power units save moving or positioning heavy pieces. They reach the work from any angle, cut "make ready" time to a minimum. Stow's 69 years of leadership manufacturing flexible shafts is your guarantee that Stow Flexible Shaft Machines have rugged dependability plus the easy portability required by today's hurry-up schedules. Our new catalog is just out, containing information which every production and purchasing man should have.

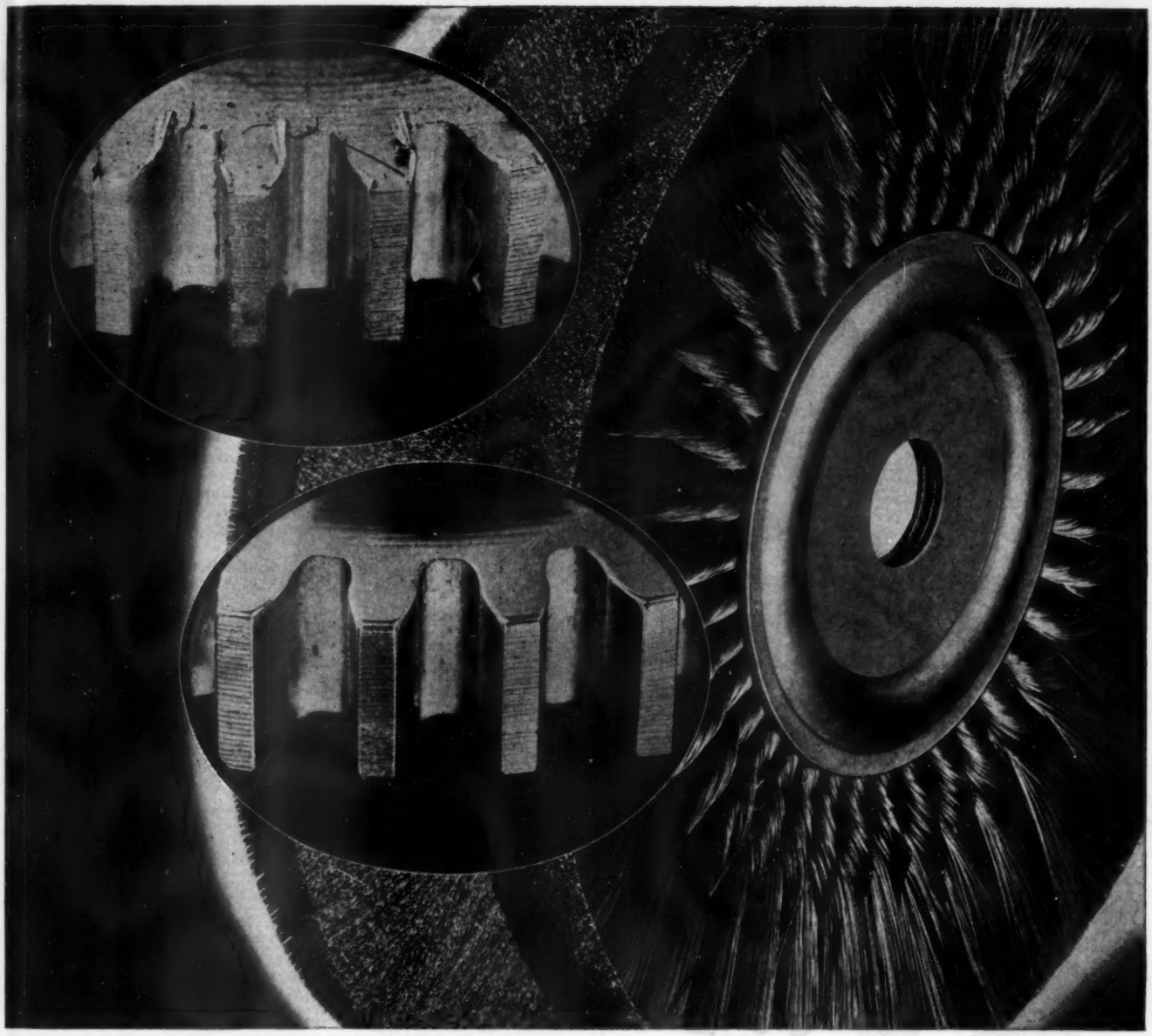
WRITE FOR IT TODAY!

Heavy-Duty Models
General Utility Models
Suspended Models
Truck Models
Bench Models

NOW! Stow Separate Shafts for Your Own Motor! A Stow Flexible Shaft, plus the great variety of attachments available, quickly convert any idle motor into rotary file, wire brush, heavy-duty drill, grinding wheel, etc. The Flexible Shaft makes such tools accessible to several operators or at a distance from the work bench. Ideal for bench operations or for touch-up and fitting at assembly line stations. Write for information on lengths, sizes, attachments, etc.

ARMY-NAVY

STOW MANUFACTURING CO.
29 Sheer St., Binghamton, N. Y.



Toothbrush for Gears

GEARS should have their teeth brushed to remove the jagged burrs and metallic fuzz that could ruin delicate moving parts.

Here is the brush that does it—in ONE OPERATION. Other methods of cleaning gear teeth require two or more operations and so take longer to do a less effective job.

The lower photograph shows the result of brush-cleaning a gear's teeth. It cannot show, however, the vastly important saving in time and cost, and the increased production that use of the *right* brush made possible.

You can get results like these on *any cleaning, burring or finishing job.*

There's an Osborn Brushing Specialist in your district who devotes his whole time to helping speed-up production . . . improve product . . . reduce cost. There is no charge for this service. Ask us for it today.

THE OSBORN MANUFACTURING COMPANY
5401 Hamilton Avenue *Cleveland, Ohio*

Osborn Brushes

WORLD'S LARGEST MANUFACTURER OF BRUSHES FOR INDUSTRY

VITRIFIED

Keep production on its toes by standardizing on . . . VITRIFIED GRINDING WHEELS

The Vitrified complete line includes also Silicate, Shellac and Resinoid bonded wheels for conditions requiring high finish, elasticity and heat resistance.

Grinding equipment—for tools or for production requirements—can be brought to higher degrees of precision and speed by standardization of Grinding Wheels.

These objectives can easily be realized through the use of Vitrified Wheels for every grinding operation, because Vitrified offers a complete line of sizes, shapes and types, processed especially for the work to be handled.

. . . Cast Iron, Bronze, etc., can be ground at low cost and efficiency on Vitrified Carborite Wheels. . . . For accurate, fast grinding of steel on a production basis, Vitrified Borite Grinding Wheels increase output and reduce costs.

. . . Also, make Silicate, Shellac and Resinoid Bonded Wheels.

Ask a Vitrified representative to show you how economically you can modernize your grinding operations by standardizing on Vitrified Wheels.

Vitrified Wheels

VITRIFIED WHEEL CO.
WESTFIELD MASS.

GRINDING WHEEL DRESSERS

Desmond Cutters *Desmond Hex Dresser*

We manufacture a complete line of Dressers and Cutters. Write for copy of catalog "A".

DESMOND-STEPHAN MFG. CO.
URBANA, OHIO
Canadian D-S Mfg. Co., Hamilton, Ont.

ARMY E NAVY

LUERS

Patented Cutting Off Tool Holders
Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured By
J. Milton Luers — 12 Pine St. — Mt. Clemens, Mich.
Produced under License issued by John Milton Luers Patents Inc.

Let's BACK THE ATTACK By Buying WAR BONDS

DRILL JIG BUSHINGS

STANDARD SIZES AVAILABLE FROM STOCK!

Made to A.S.A. Standard in HEADLESS PRESS FIT, HEAD PRESS FIT, FIXED RENEWABLE, HEADLESS LINERS and SLIP RENEWABLE types—also a complete line of Accessories.

Manufactured to precision tolerances from fine grade of tool steel carefully heat treated.

Write for catalog No. 243.

ACCURATE BUSHING CO., 440 North Ave., Garwood, New Jersey

WAR EFFICIENCY *that Carries Through to* PEACETIME PRODUCTION

SIEWEK STANDARD RAPID CLAMPING DRILL JIGS

Spring or Rack-and-Pinion Types
Square or Oval Top Plates

Four E-2 Spring Type Siewek Jigs on a rotary table

● Now doing an outstanding job in war production, Siewek Standard Drill Jigs can be turned to new peacetime products easily. They are designed for conversion—the same change that makes each Siewek Drill Jig usable on a number of wartime products—the shift to another adapter and top plate.

Wide acceptance in war plants of these standard drill jigs is due to this feature, for it means a saving of time, material, labor and money. One Siewek Jig takes the place of dozens of special jigs, since simple adapters, as many as you need, fit the standard jig for a variety of jobs.

The shop using standard Siewek Rapid Clamping Drill Jigs will be in a position to keep up with sudden changes in product design. Having served so well on war production, these jigs immediately will be available to work on peacetime products when Victory is won.

Contact a Siewek representative in your territory, or write us for Catalog No. 50J describing 50 different sizes and types.

Type H Horizontal Rack and Pinion Jig for 2-way Drilling

Type E Spring Jig

Type D Spring Jig

Type B Jr. Spring Jig

Type C-L Rack and Pinion Jig

50 DIFFERENT SIZES AND TYPES

SIEWEK TOOL DIVISION

OF DOMESTIC INDUSTRIES, INC.
DETROIT (Ferndale Station) MICHIGAN
Representatives in Principal Cities

Designers and Builders of
SHEAR-CUT END MILLS

●

Affiliated with SIEWEK ENGINEERING DIVISION
a nationally known organization staffed with experienced engineers—Consulting, Processing, Designing and Fabricating
Chicago • Detroit • Springfield, Mass. • Hartford, Conn.

THE HARTFORD *Quick Acting* MILLING VISE

Great in Gripping Power

•

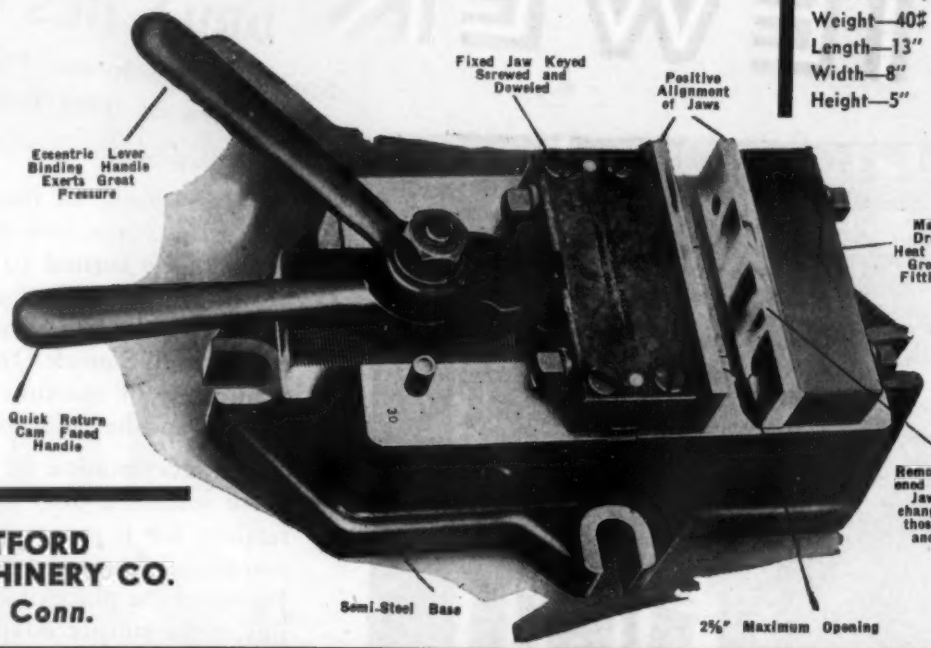
Quick in Release

•

Manipulated by One Hand

Made in Plain and Swivel Jaw Types

Every part of the "HARTFORD" is made for maximum strength. Base is of semi-steel and movable jaw of drop forged, heat treated steel. Construction of movable jaw with ground fitting surfaces is such that single pieces can be held at either end of jaw without danger of distortion. *Investigate!*


Eccentric Lever Binding Handle Exerts Great Pressure
Fixed Jaw Keyed Screwed and Doweled
Positive Alignment of Jaws
Movable Jaw Drop Forged Heat Treated and Ground on all Fitting Surfaces
Quick Return Cam Faced Handle
Removable Hardened and Ground Jaws. Interchangeable with those of No. 2B and S. Vise
Semi-Steel Base
2⅝" Maximum Opening

SPECIFICATIONS

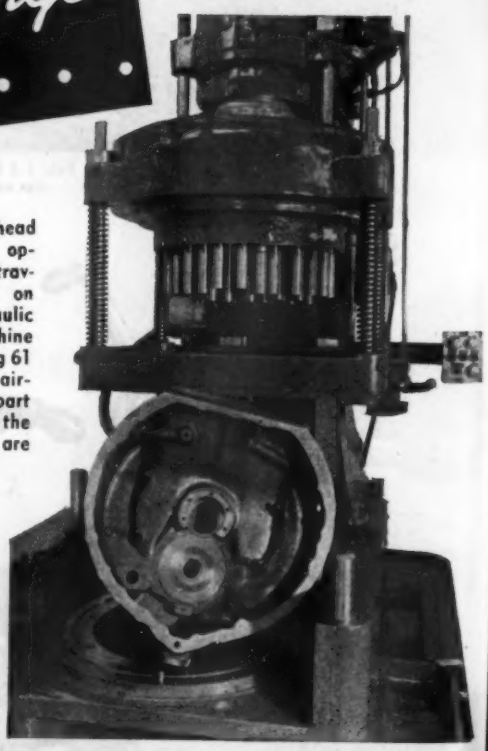
Jaw width—5"
Jaw depth—3/16"
Max. opening (Plain)
Jaws in place—2⅝"
Jaws removed—3½"
Max. opening (Swivel)
Jaws in place—2¼"
Weight—40#
Length—13"
Width—8"
Height—5"

The HARTFORD SPECIAL MACHINERY CO.
Hartford, Conn.

61 HOLES DRILLED IN *Supercharger* REAR COVER IN 32½ SECONDS . . .

★ Material SAE-4140-Brinnell 241-285 — 50 feet per minute. Longest operation — 21/64 drill — 2" deep — 611 r. p. m. .006 feed — 32½ seconds.

No shifting of jig for each hole — no feeding of machine for each individual hole — but one pass necessary and drilling of all 61 holes is finished.



Special auxiliary head and hydraulically operated in and out travel table mounted on H-4 Hydram Hydraulic Feed Drilling Machine equipped for drilling 61 holes in customer's aircraft parts. Note part and flange in which the group of holes are drilled.

The special Hoefer auxiliary head illustrated is only one of many types available. The work shown is but typical. Any number of spindles up to the capacity of your machine is available. Other heads will drill, tap, ream, countersink, chamfer, or bore holes in a straight line. They also have adjustable centers for various sizes of work. Hoefer heads increase production from the same floor space, decrease handling time, and lessen operator fatigue.

Write us regarding your drilling problems. Our wide experience can be of immediate value to you. If you have a multiple hole drilling requirement we not only have the modern answer but a cost-saving one as well.

Hoefer's Whole Business is Holes . . . **HOEFER MFG. CO.** *Freeport, Ill.*

. . . and this marked improvement in tool finish is attained at a lower cost per tool ground.

It's all in the technical design and abrasive composition of this new Electro grinding wheel —

. . . the way it hugs the tool, requiring less pressure for sharpening and greatly reducing vibration.

. . . how burning and chipping of tool edges are avoided by exceptionally cool cutting action without localized heating.

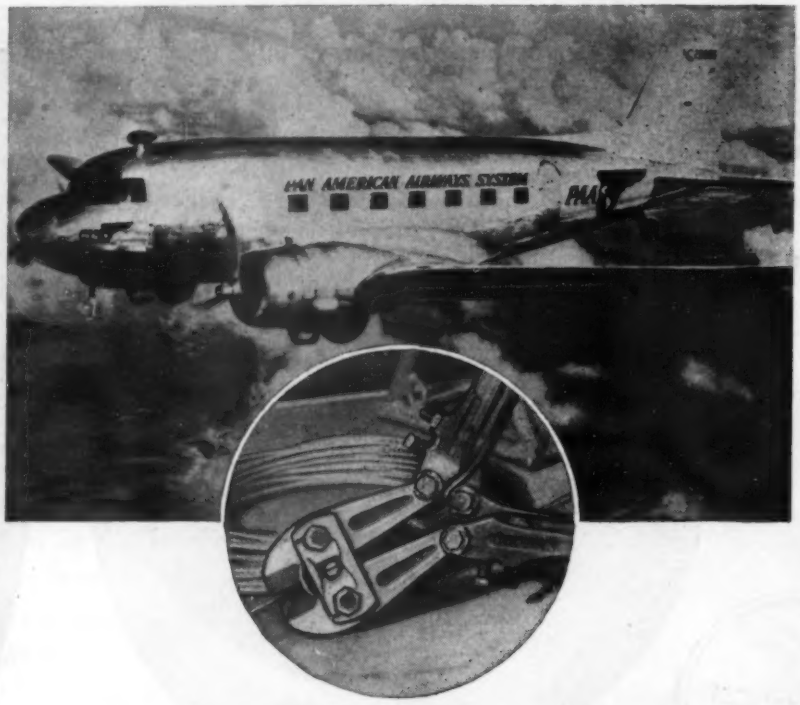
. . . why this wheel lasts 50 to 100% longer than conventional types.

Test this new wheel in your shop. Measure the improved tool finish under magnification. Hundreds in the machining industry have convinced themselves in this manner.

FOR WAR PLANTS - PROMPT DELIVERIES FROM STOCK

ELECTRO REFRACTORIES AND ALLOYS CORP.

VARS BLDG.
BUFFALO 2, N. Y.



KEEP THEM FLYING

For every man in the air there must be many men on the ground. For every Clipper in the air there must be tools on the ground — men and tools to prepare and repair quickly and properly. The picture below shows a Porter Standard Cutter in use — cutting control cable at Balboa Hangar of Pan American World Airways.

Porter tools multiply man power to cut control cables, strand wire, bolts and rods easily and quickly. Standard models serve many purposes and many industries. Special aviation models including bench type cable cutters.

H. K. PORTER, INC., 402 Ashland St., Everett 49, Mass.

Write for catalog of Porter hand power Cutters also special Tool Maintenance Book. If you have a special tool need such as bending, pressing, crimping, etc., to which Porter toggle joint principle may be applied, consult our engineering department.

PORTER HKP CUTTERS

PROTECTION against dead center WEAR

Excessive wear on the dead centers of your lathes may mean faulty set-ups, inaccurate work, slowed-down production.

DIXON'S LATHE CENTER GRAPHITE LUBRICANT

— minimizes friction at this point which results in decreased wear and replacement of centers. Invariably to some extent, it means decreased power consumption. It means more accurate work and increased production.

This product possesses unusual film strength to resist the severe conditions of presssure and heat as it lubricates. It is a non-fluid lubricant which can be quickly applied from the handy collapsible tube, thus eliminating the inconvenience of filling squirt cans, applicators or handling a brush or paddle. Does not harden or "skin over", even if long exposed to the air.

Available from supply houses in 1, 4 and 8-ounce tubes. 5598

JOSEPH DIXON CRUCIBLE CO., JERSEY CITY 3, N. J.
Canada: Canadian Asbestos Company
Montreal • Toronto • Vancouver • Winnipeg

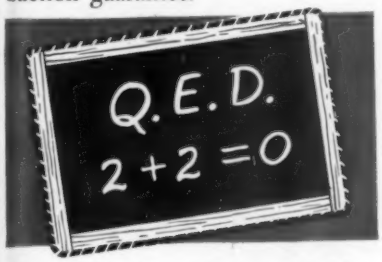
Ticonderoga, No. 635 and Microfyne Graphite
Pipe Joint Compound · Graphite Seal · Graphited Oil
Cup and Pressure Gun Grease · Gear Lubricant
Waterproof Graphited Grease · Auto-Marine Grease
Graph-Air Guns · Belt Dressing (Contains no Graphite)

Cutting oil *News* letter

Practical suggestions from the field on how cutting oils and coolants are being used by midwest machine operators to lick tough wartime jobs

JUNE, 1944

Die on way to doubling guaranteed production. To speed cold nosing on shells, a Nebraska plant used a special alloy die guaranteed to turn out 300,000 shells without excessive wear. Stanostamp "C"—a stamping compound used widely because of the protection it gives to dies—was applied to the job. After 500,000 shells were nosed, the die was still as true as when it started. It is on its way to more than doubling the production guarantee.



Or why flooding work with better coolant betters finish. In milling aluminum, a Minnesota machine shop doing war work had two problems. 1. Finish was far from satisfactory. 2. It was difficult to maintain tolerances. Mineral Seal Oil, used as a coolant, was fed drop by drop to the work and tool.

A Standard Cutting Oil Specialist, called in to see what he could do, had two suggestions. 1. Use Stanicut 62 FC mixed 5 to 1 with Mineral Seal Oil. 2. Flood the tool and work with this mixture instead of feeding it a drop at a time.

Both finish and accuracy were completely satisfactory with the new oil and application.

Q.E.D. 2 problems + 2 suggestions = 0 trouble.

Triple saving surprises manufacturer. Torn threads in machining stainless steel stock posed a problem for a screw machine product manufacturer in Michigan. Spoilage cut materially into profits. The waste of scarce materials was even more important at the time. Poor tool life seemed to be one cause as well as a problem. A real effort was made to find the answer. A number of cutting fluids were thoroughly tested—Stanicut 137BCS being the last one. It was last because no more were tried; it more than answered the need.

With Stanicut, threads improved and rejects were practically eliminated. Production jumped 47% on the operation. Tool life was tripled. Three blessings where the manufacturer had looked for but one.

Lubrication engineering helps high-speed press handle deep draw. To make equipment on hand do the job that was needed, was a frequent problem when plants were changing over to war work. The situation may be repeated in reconverting to peacetime production. The experience of an Indiana plant may be helpful in either case.

The job was deep-drawing an aluminum cup with a 3/8 inch radius at all edges. The problem was breakage. The principal reason was the fact that the minimum speed of the press was too fast for the job. The plant men were well aware of this—but that didn't solve the problem. The job had to be done. The press had to do it. The only possible remedy left was to find a stamping compound that might help.

Materials that were first tried gave discouraging results. The scrap pile mounted and usable parts were few and far between. A Standard Cutting Oil Specialist saw the job. He recognized the unusual demands and recommended an unusual cure—Acme Base Oil Extra Heavy. It did the trick—parts are now being produced on this press with less than 1 percent scrap.

Perhaps Acme Base wasn't the *only* answer, but it was the *right* answer at the *right* time.

See your Standard Cutting Oil Specialist. One of these Engineers can help you find the answer to your difficult metal working problem. Call the nearest Standard Oil Company (Indiana) office, or write 910 South Michigan Ave., Chicago 80, Illinois for his help. In Nebraska, write Standard Oil Company of Nebraska at Omaha 2.

Gasoline Powers the Attack...
Don't Waste a Drop

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

★ LUBRICATION ENGINEERING

LUBRICATION ENGINEERING • • LUBRICATION ENGINEERING • • LUBRICATION ENGINEERING • • LUBRICATI

Standard Coded Lubrication Service

. . . just as easy as it looks to get the right lubricant in all the right places

• A SIMPLE NUMBERED SYSTEM—that speaks all languages—tells oilers what lubricant is needed and where it goes. Ask the men in charge of your lubrication, if that isn't just what they have been waiting for.

They know it's comparatively simple in most instances to pick the right lubricant for the job. It's another matter to be sure *that* lubricant—and *only* that one—is applied *every time.* The illustration at right shows how easily Standard *Coded* Lubrication Service solves this problem for you. Here's the key:

A. A code number is assigned to each lubricant used in the plant, and a bright decal applied to each storage container indicating the lubricant it holds. (Follow lubricant #2 in the illustration.)

B. Every container on the lubrication cart (if one is used) is also marked with this code number by a decal. (Lubricant #2 only is marked in the picture.)

C. Every oil can—or grease gun—is identified by a decal and filled from the cart or storage container with that numbered lubricant. (Again #2 in the picture.)

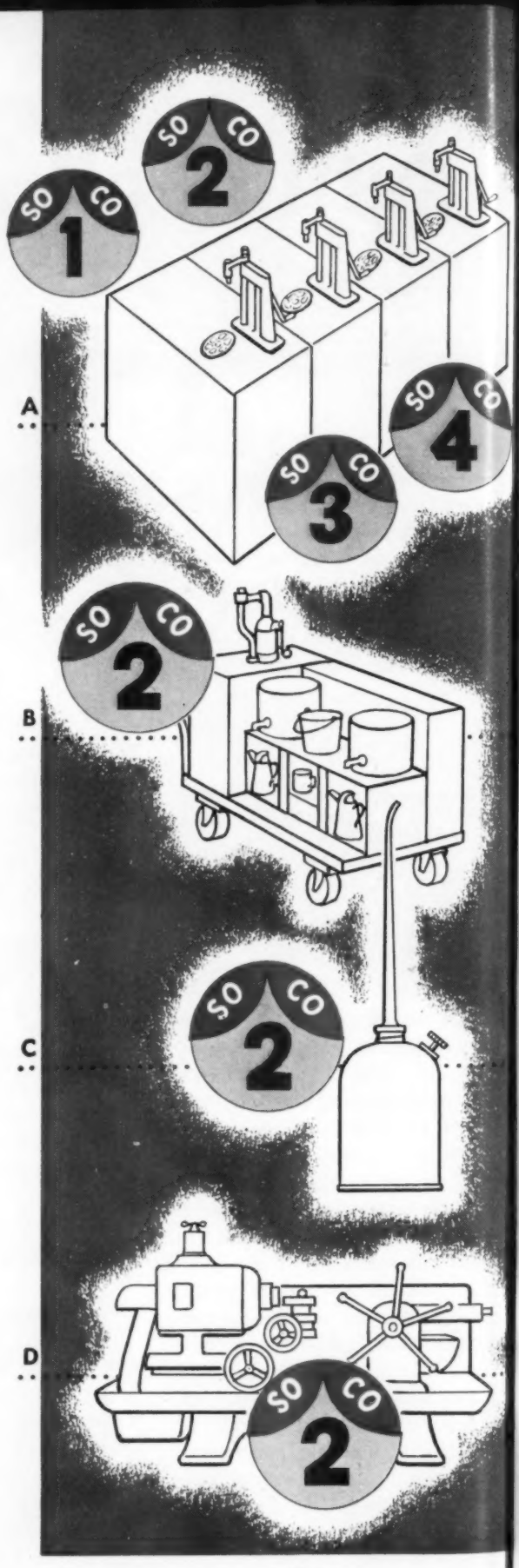
D. Every spot to be lubricated on each machine is marked with the code number of the lubricant required.

Your oilers simply follow the numbers in getting the right lubricant where it belongs. In addition, however, you can have machine record cards for each machine showing the number of points to be lubricated or other information which may seem necessary.

The only record you keep is a lubrication chart listing the lubricants used in your plant, and the code numbers assigned to them. This chart is made when you install the system, and is kept in the oil room with duplicates in other files as needed for reference. Lubricants are ordered by brand names just as you do now and applied by numbers. The code numbers you assign have no significance elsewhere.

Here's how to get this service. Discuss this plan with your lubrication men. Ask to have a Standard Oil Representative call and explain the details. Whether you use Standard Oil's Lubricants exclusively or not, if your plant is in the Middle West, you can get this service—including decals, forms, and help in installing the system, or *fitting it into your present system.* Simply call the nearest Standard Oil Company (Indiana) office, or write 910 S. Michigan Avenue, Chicago 80, Illinois. In Nebraska, write Standard Oil Company of Nebraska at Omaha 2.

Gasoline Powers the Attack . . . Don't Waste a Drop



STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

★ LUBRICATION ENGINEERING

DISTORTION TROUBLES? NOT WITH THIS DIE STEEL!

The die-maker, one of the master craftsmen of our time, has every reason for confidence in Bethlehem's Lehigh Die and Tool Steel, H Temper. For this is a steel that is engineered to fight distortion, a problem as old as die-making itself.

High distortion, occurring in the hardening operation, can ruin the labor of days, or even weeks. When an intricate die is machined to limits of a few ten-thousandths of an inch, resistance to deformation is an asset almost beyond value.

That's why Lehigh Die and Tool Steel, H Temper, is one of the aristocrats of the tool room. A product of long study and development, this air-hardening steel shows an absolute minimum of distortion . . . *plus* good machineability, a high degree of toughness, and superlative ability to withstand abrasion. Another characteristic is its unusually hard surface, which is reinforced by excellent deepening properties.

Though primarily air-hardening, Lehigh H Temper can be oil-quenched for greater wear resistance.

You'll find Lehigh H a versatile steel. Besides its uses in die-making, it does a first-class job in such important tools as gauges, punches, taps, rotary slitting cutters, forming and bending rolls, mandrels, shear blades, thread-rolling dies, etc.

BETHLEHEM STEEL COMPANY, Bethlehem, Pa.
BETHLEHEM STEEL EXPORT CORPORATION, New York City

★ ★ ★ BETHLEHEM STEEL ★ ★ ★

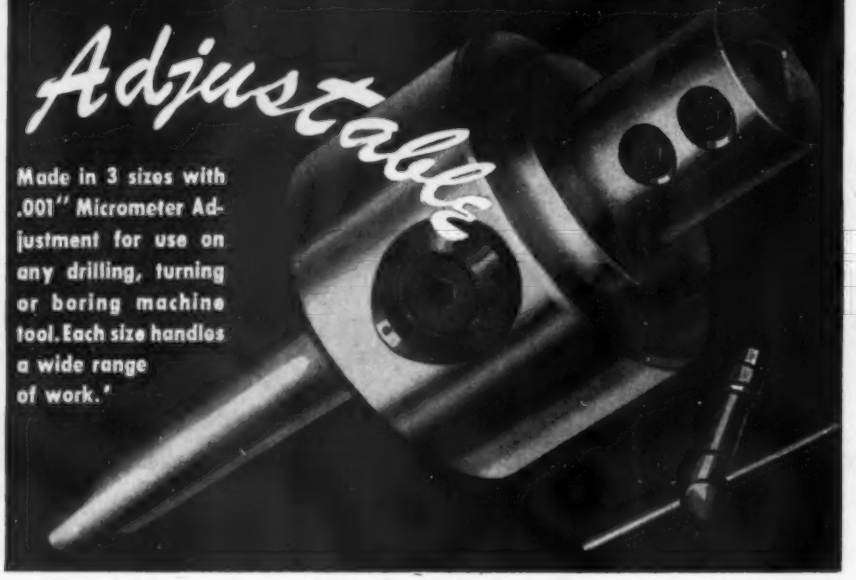
LEHIGH H TEMPER . . . one of Bethlehem's BIG 8 Tool Steels

Rickert Shafer

FOR 35 YEARS

R-S BORING HEAD

Adjustable



Made in 3 sizes with .001" Micrometer Adjustment for use on any drilling, turning or boring machine tool. Each size handles a wide range of work.

Another R-S second operation tool that will speed your war work. For over 35 years Rickert-Shafer has specialized in the design and manufacture of precision tools for production threading This Boring Head was developed years ago to answer a request for a simple, adjustable wide range and accurate boring tool that could be adapted to any milling machine, turret lathe or drill press. Write for complete data and be sure to indicate the priority rating of your work.

RICKERT-SHAFER CO · ERIE, PA.

DIE HEADS · COLLAPSIBLE TAPS · BORING HEADS
TAPPING MACHINES · SPECIAL THREADING MACHINES

LAPPING COMPOUNDS

made expressly for precision lapping

• GAGES •
• DIES • TOOLS •
• INSTRUMENTS •

PLATE . . . MACHINE . . . HAND

• The abrasives are suspended in a special grease composition paste base that becomes an oily film under pressure of lapping. This base was developed expressly for hand, plate and machine lapping.

For dilution or extra lubrication mix with small quantity of thin film oils such as kerosene, spindle.

★

MEDIUM COARSE
Grade No. 302½.....60¢ per lb.

MEDIUM FINE
Grade No. 303½.....60¢ per lb.
Above packed in 10½ and 52 lb. cans

EXTRA FINE
Grade No. A-600
Crystolon .....75¢ per lb.
TM. Reg. U. S. Patent Office (silicon carbide)
Grade No. A-600
Alundum .....75¢ per lb.
TM. Reg. U. S. Patent Office (crystalline alumina)

VERY EXTRA FINE
Grade No. 2600A.....90¢ per lb.
Grade No. A-20X.....90¢ per lb.
Grade No. 38-900A.....90¢ per lb.
(special chrome plate)
Grade No. GK-7A.....90¢ per lb.
(high reflective finish on steel)
Packed in 8½ and 42 lb. cans
Large Glass Jars, all Grades .....$1.00 each

Sample carton containing 1 oz. jar of each of the above compounds mailed post paid upon request.

"LMKT" LAPPING LUBRICANT
A substitute for sperm oil on lapping operations.
Single gallon cans.....$2.00 per gal.
Six—1 gallon cans.....$1.75 per gal.

Also many other compounds: Valve Grinding, Gear Lapping, Ball Bearing Raceways, Finishing, Polishing—All Types. Write us for samples.

Recommended by Norton Company for use on their Lapping Machines.

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UNITED STATES PRODUCTS CO.

518 MELWOOD ST., PITTSBURGH, PA.

IS THERE ANYTHING *Special* ON YOUR MIND IN THE WAY OF *milling cutters?*

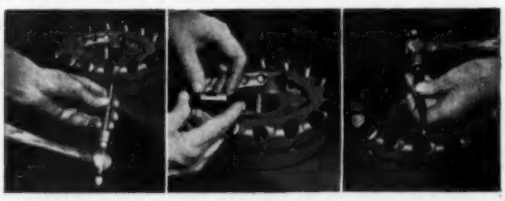
With a milling cutter line as complete as Lovejoy's, there is seldom need for special cutters. But . . . when that need does arise, it will pay to call on Lovejoy for their specialized knowledge on how to design and manufacture these specials to do your jobs *exactly!*

We have designed and built special milling cutters, boring tools, spot facing tools, etc., for the past 26 years, and every one has had that exclusive Lovejoy feature—*positive-locking** blades. This basic design pays off in increased production, less down time, less power consumption and greater accuracy.

So, whether you order special or standard Lovejoy tools, you can count on them doing the job, and doing it economically.

Our Catalog No. 26 illustrates the Lovejoy line of inserted-tooth cutters. Send for your copy today!

*Lovejoy manufactures a complete line of inserted-tooth type products—all equipped with the famous Lovejoy positive-locking device to assure maximum production at minimum cost. The illustrations at the right show how simple it is to keep Lovejoy tools at highest cutting efficiency.



Tap out the wedge— Move the shoe down— Tap in the wedge—Grind

IT'S AS SIMPLE AS THAT!

Lovejoy TOOL COMPANY, Inc., SPRINGFIELD, VT., U.S.A.

MILLING CUTTERS · BORING HEADS · ARBORS · SPOT FACING TOOLS · COUNTERBORES · BORING BARS · SINGLE POINT TOOLS · TURRET TOOL POSTS

4 WAYS TO GET BETTER SAWING JOBS

CLEMSON BRO
STAR UNBREAKABLE SPECIAL FLEXIBLE
STAR MOLY HIGH SPEED

1 **GET THE RIGHT NUMBER OF TEETH:** Selection of a blade should depend on the type of material to be cut, and the shape of the piece. But, as a general rule, a hand blade having 18 teeth to the inch will be found satisfactory for run-of-the-shop work.

2 **GET THE RIGHT GAUGE OF BLADE:** Using a blade that is too thin on coarse metal, or a thick blade on thin-walled pieces or sheets, results in unsatisfactory work —and causes waste of labor and material.

3 **GET THE RIGHT LENGTH AND WIDTH OF BLADE:** In the choice of a blade of proper length and width the experienced mechanic considers the kind of material to be cut, the shape, and whether the job is needed in a hurry.

4 **GET THE RIGHT TYPE OF BLADE:** When all these factors have been considered, choose the STAR High-Speed Steel "MOLY"* Type blade for fast, accurate cutting, and the Unbreakable Special Flexible blade for tough sawing jobs in awkward positions.

These same basic principles apply to STAR Power Blades and STAR Flexible Metal Cutting Band Saw Blades – plus consideration of pressure and feed. Remember, the most skilled mechanic is no better than the tools he uses.

On power hack saws, *feed* and *pressure* are as important as the use of the proper blade.

STAR Band Saw Blades come cut to length and welded or in coiled stock.

CLEMSON BROS., INC.
MIDDLETOWN, N. Y.

*T.M. Reg. – Blades bearing the name "MOLY" are made only by Clemson Bros., Inc., and affiliated companies.

CLEMSON
Makers of Hand and Power Hack Saw Blades, Frames, Band Saw Blades, and the Clemson D-17 Lawn Machine.

1 SCREW ADJUSTMENT ...CUTS SET-UP TIME EXTENDS TOOL LIFE

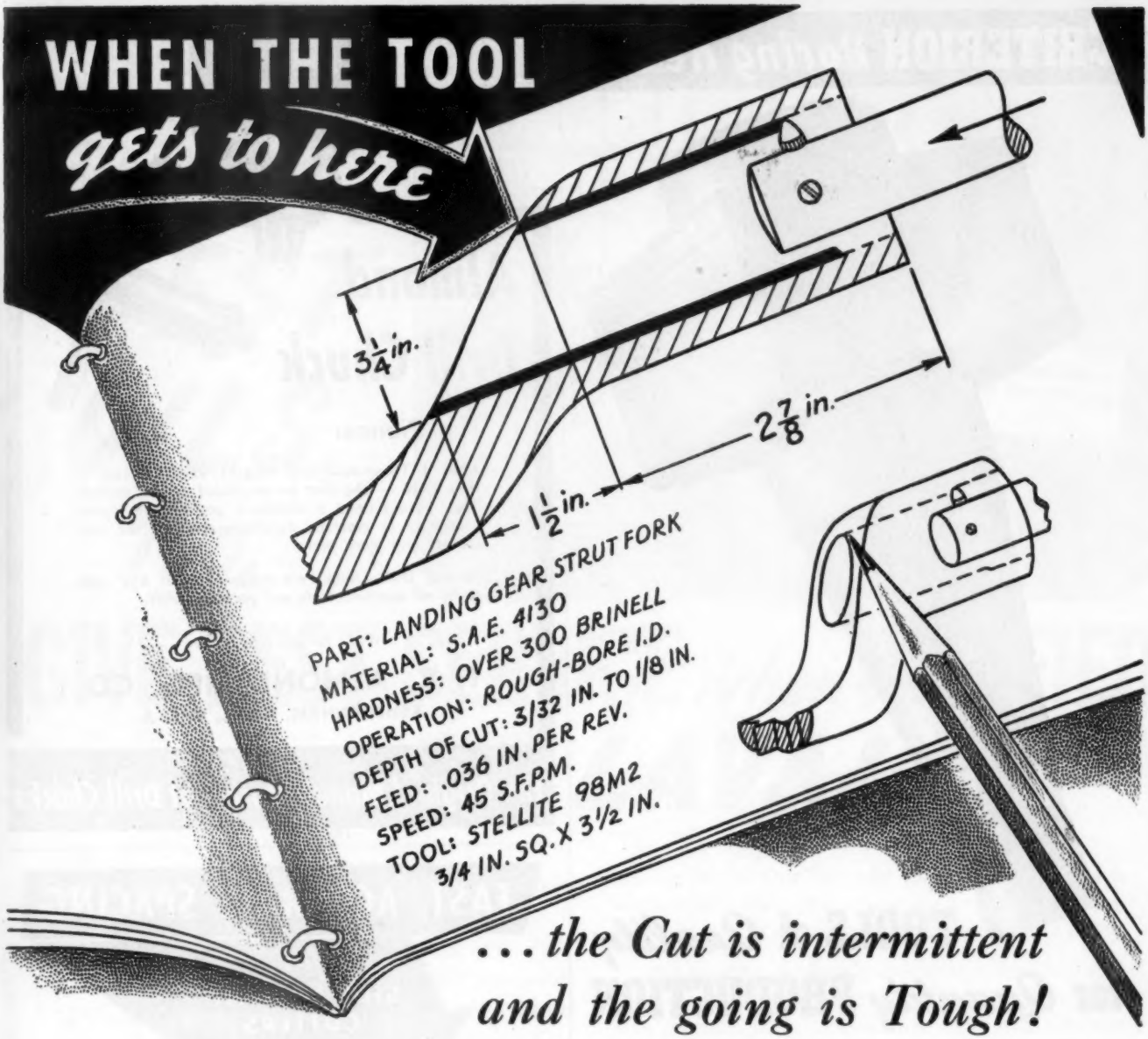
You save vital minutes in reaming operations because of Madison's unique one-screw adjustment. A Madison cutter can be slipped from the Madison bar and reset to any desired dimension with an ordinary screw driver or expanded to make up for wear or regrinding. Reinserted in the bar you can be sure both cutting edges will cut. One screw adjusts both blades, eliminating the possibility of an off-center adjustment. Then, too, Madison cutters are pre-sized and any number may be stored in the crib. This makes it unnecessary to disturb an original set-up when a cutter becomes dull. The dull cutter is merely slipped from the bar and the new or sharpened cutter inserted in its place. One-screw adjustment is exclusive with Madison reaming tools.

Write for the new Madison catalog just off the press. Shows complete lines, prices, and grinding instructions that will save you time and money.

MADISON
MANUFACTURING COMPANY
SPRING & BAUER STS., MUSKEGON, MICH.

MADISON ADJUSTABLE REAMING TOOLS

WHEN THE TOOL *gets to here*


3 1/4 in.
2 7/8 in.
1 1/2 in.
PART: LANDING GEAR STRUT FORK
MATERIAL: S.A.E. 4130
HARDNESS: OVER 300 BRINELL
OPERATION: ROUGH-BORE I.D.
DEPTH OF CUT: 3/32 IN. TO 1/8 IN.
FEED: .036 IN. PER REV.
SPEED: 45 S.F.P.M.
TOOL: STELLITE 98M2
3/4 IN. SQ. X 3 1/2 IN.

. . . the Cut is intermittent and the going is Tough!

Rough-boring the I.D. of aircraft landing-gear strut forks of over 300 Brinell hardness . . . at the speed, feed, and depth of cut required to maintain schedules . . . is a severe test of the high-production qualities of cutting tools. This is particularly true during the 1½ in. of intermittent cutting, as sketched above.

Stellite 98M2 tools are standard on this job because they do the work in minimum floor-to-floor time, and at low cost per piece machined.

On many other steel machining jobs where a high rate of metal removal is required, Stellite tools are maintaining production schedules at low machining costs.

Write for the Stellite 98M2 Tool Price List. It describes the properties and available forms of Stellite standard tools. Information on Stellite *special* tools can be obtained from any District Office.

BUY UNITED STATES WAR BONDS AND STAMPS

HAYNES STELLITE TRADE-MARK

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

New York, N. Y. UCC Kokomo, Indiana

Chicago—Cleveland—Detroit—Houston—Los Angeles—San Francisco—Tulsa

• HIGH-PRODUCTION METAL-CUTTING TOOLS •

"Stellite" is a registered trade-mark of Haynes Stellite Company.

CRITERION *Boring Heads*

TOOLS of *Quality* for *Quantity* PRODUCTION

Noted for maintaining original accuracy over a longer period. Criterion Heads are smooth, compact, rigid. Parts subject to wear are hardened. LEAD SCREW IS HARDENED TOOL STEEL, WITH THREADS GROUND FROM SOLID AFTER HARDENING. All heads have large, graduated dial. Large offset adjustment eliminates need for offset boring bars. Two sizes: 1½" and 3". ½" and 1" bar capacity. Shanks are interchangeable, enabling operator to use head on different machines. Ideally adapted for slide boring tool holder on small turret lathes. Ask your dealer or order direct. Request free literature.

CRITERION
MACHINE WORKS
BEVERLY HILLS, CALIFORNIA

Almond Drill Chuck

The Pioneer

Almond Three-Jaw Drill Chucks were Pioneers in their field — the first to be placed on the market. They have formed a necessary part in the logical procedure of machine developments over the past seventy and more years.

Almond Drill Chucks are made in types and sizes *to fit all machine tools and portable drills.*

Write for complete details

T. R. ALMOND MFG. CO.
ASHBURNHAM, MASS., U. S. A.

The Original Manufacturers of Drill Chucks

FAST, ACCURATE SPACING

for
SIDE MILLING CUTTERS
GANG MILLING SET-UPS

DAYTON ROGERS ADJUSTABLE SPACING COLLARS

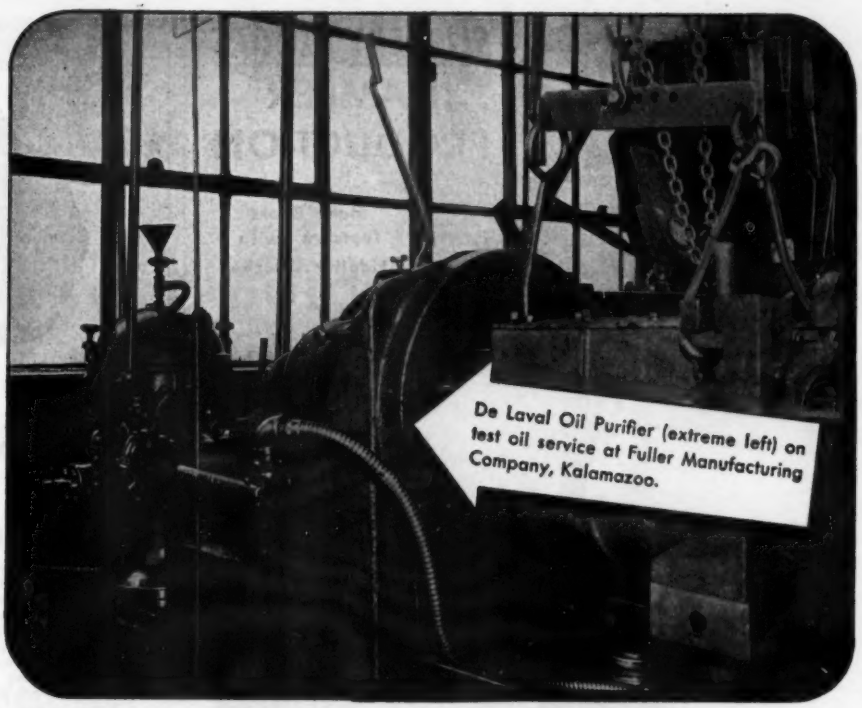
are made in 12 standard sizes for cutter arbors from ⅞" through 2"—other sizes on request.

You have plus or minus .0005" at your finger tips with Dayton Rogers Adjustable Spacing Collars. Graduated in thousands, you can make an accurate and positive adjustment by simply loosening the cutter arbor nut and making necessary corrections as illustrated above.

Try them once and you will never run a gang or multiple milling job without them. Write today for full particulars.

DAYTON ROGERS MFG. CO. Minneapolis, Minn.

★ TEST OILS, too,



De Laval Oil Purifier (extreme left) on test oil service at Fuller Manufacturing Company, Kalamazoo.

GIVE BEST SERVICE *when* PURIFIED *by* DE LAVAL

ON the test floor of the Fuller Manufacturing Company, Kalamazoo, a De Laval Oil Purifier replaced a less efficient method of removing dirt and metallic particles from transmission test oil. Now the oil is constantly maintained at full effectiveness and can be used over and over again with complete satisfaction and safety.

Purification of test oil is but one of many time, labor and materials saving functions performed by De Laval centrifugal machines in industrial plants. For example, worthwhile savings can be realized by use of De Laval Cutting Oil Reclamation Systems, for the oil can be used for indefinite periods when even the finest particles of metal are removed by means of a De Laval Oil Purifier, and the life of the tools is materially prolonged. Moreover, De Laval Extractors assure maximum salvage of oil and chips.

Still another profitable application for De Laval centrifugals is the removal of metallic and abrasive particles from coolants with De Laval Coolant Clarifiers. Such clarification makes it possible to grind to closer limits, enables finer finishes to be secured, prolongs wheel life and saves coolant.

These are only a few of the many applications for De Laval centrifugals in metal-working plants of all sizes. Investigate for yourself.

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DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 19
THE DE LAVAL COMPANY, Limited
MONTREAL PETERBOROUGH WINNIPEG VANCOUVER

De Laval PURIFIERS *and* CLARIFIERS *for Factory Oils*

FOR GREATER OPERATING EFFICIENCY

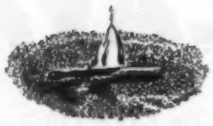
Fidelity ABSORBO
OIL AND GREASE ABSORBENT AND FLOOR CLEANER

SLIPPERY FLOORS HAMPER PRODUCTION

Make floors *footsure* with Fidelity Absorbo

EASILY

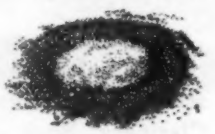
- **APPLIED**
- **SWEPT UP**



NON-COMBUSTIBLE

FIDELITY ABSORBO soaks up oil and grease to 50% of its own weight . . . simply sprinkle on and sweep up. In case of recurring oil spills, it may be allowed to remain until thoroughly saturated. Either way, you have a dry surface, safe for employees and trucking vehicles.

Fidelity Absorbo is *flameproof*, too . . . approved as a Class 1 non-combustible by Underwriters' Laboratories. It is *non-abrasive* . . . composed of sponge-like granules that will not mar machine parts or surfaces. And it is *economical* . . . a little goes a long way.



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NON-ABRASIVE

FOOTSURE

Send for trial 50 lb. bag at $2.75 F.O.B. Newark, with unconditional money-back guarantee if not satisfactory. Substantially reduced prices on quantity orders. (Territories are open for local distributors. Write for details.)

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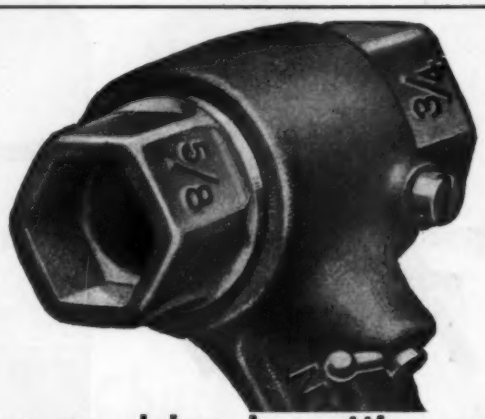

Now no delay in getting your FAVORITE Reversible Ratchet Wrench

Though Uncle Sam is using FAVORITE Wrenches by the thousand, there are plenty now available for essential private industry. So don't put off ordering these time-saving, fatigue-preventing wrenches.

Some FAVORITE features . . . speedy ratchet action . . . no lifting off at every quarter turn . . . skillfully balanced weight . . . each head handles two sizes of nut; operates easily in narrow spaces and over extending studs—only a FAVORITE gives you all these wrench advantages.

Three sizes, each handling five heads, fitting ten standard nut sizes. Ask at your supply house.

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Plants: New York, N. Y., and North Wales, Pa.

FAVORITE
Reversible Ratchet Wrench

ACROMARK your products ..FASTER!

STAMPS BOTH LETTERS AND FIGURES INTO STEEL AND ANY METAL OR PLASTIC

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These new improved type testers available from stock.

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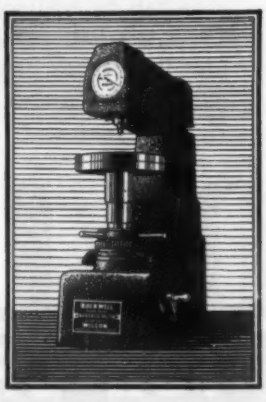

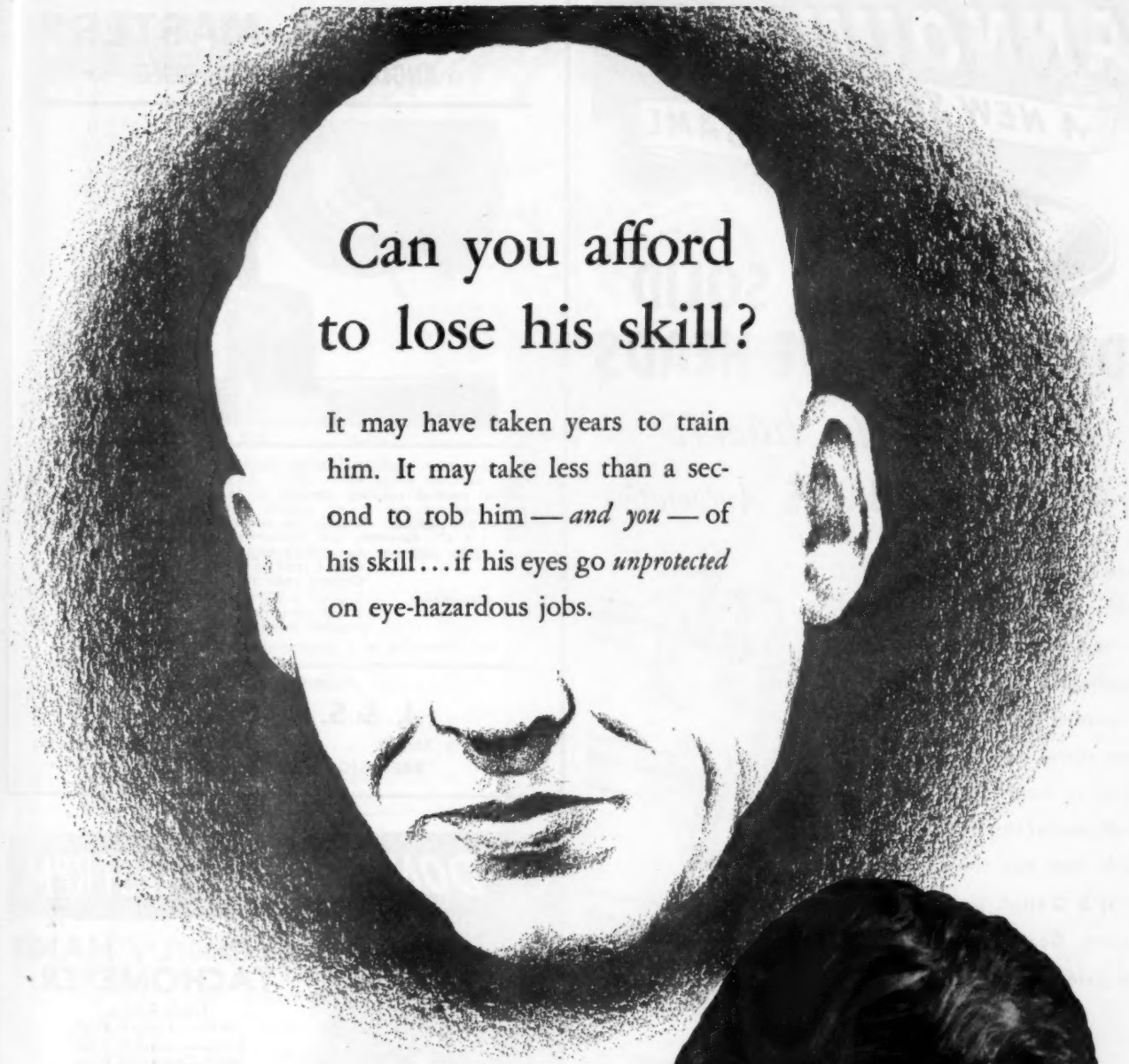

Can you afford to lose his skill?

It may have taken years to train him. It may take less than a second to rob him — *and you* — of his skill... if his eyes go *unprotected* on eye-hazardous jobs.

AO Goggles will protect him... *and you*

For about 7½¢ per eye — the price of AO Safety Goggles — you can protect him and hundreds like him who keep your production *going*.

American Optical
COMPANY
SOUTHBRIDGE, MASSACHUSETTS

Call in an AO Man — and keep your "production eyes" producing.

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A NEW SERIES of Style SAML

H&G

SOLID ADJUSTABLE DIE HEADS

with Insert Chasers

for **BROWN & SHARPE** *Automatics*

Made in five sizes for B & S automatic screw machines, numbers 00, 0 and 2. A new alignment feature takes care of variation in alignment between turret and spindle. The holder is now made an integral part of the head. These Heads use the famous low cost H & G High Speed Insert Chasers. Good deliveries on high priorities.

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● *Contains detailed information and specifications you will need.*

The Eastern Machine Screw Corp.

MANUFACTURERS OF H & G DIE HEADS SINCE 1914

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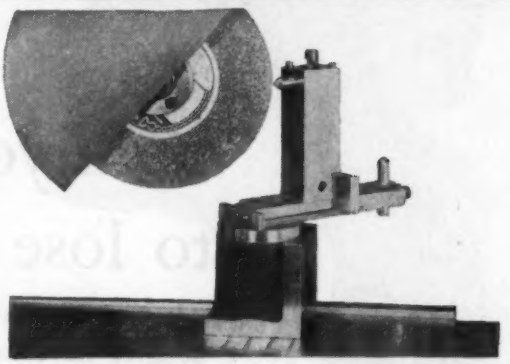
The "FORM-MASTER"

ANGLE & RADIUS DRESSER



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It readily produces: Any desired angle
Convex radii to 4" on 7" wheel
Concave radii to 7" on 7" wheel

Specifications: Base 3" x 3", height 8½"
Wheel capacity 10"
Angular travel 3"

For information or a demonstration CALL YOUR SUPPLIER

Manufactured by

J. & S. TOOL CO.

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"PRECISION DRESSING TOOLS"

DON'T GUESS! TEST R.P.M.

With a MODEL "J" **HAND TACHOMETER**

Triple Range:
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1000— 4000 R.P.M.
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WRITE FOR BULLETIN #706

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Profitable on any work involving 25 pieces or more

Available in 25 styles for gaging up to 12".
May be set in tool room for each job, go to job with job ticket, return to tool room and re-set for other jobs.

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PAGE has been turning out a bigger tonnage of electrodes than ever before in **PAGE** history. And they have *all* been used on work that had to pass the closest scrutiny of Army, Navy and Air Corps inspectors. They have *had to be good!*

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●

Ask the local **PAGE** distributor about **PAGE** Hi-Tensile "C" Electrodes—as well as the complete range of **PAGE**-*Allegheny* Stainless Steel Electrodes.

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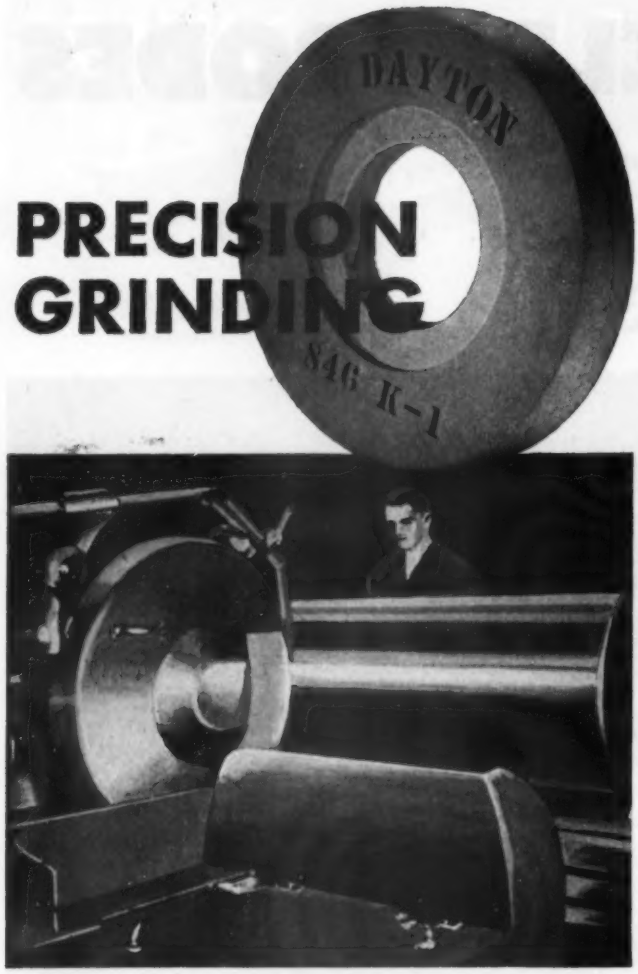
PRECISION GRINDING



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- LONG WHEEL WEAR

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You'll find Dayton Grinding Wheels have what it takes — are engineered to fit your job and to do that job precisely as the operation requires.

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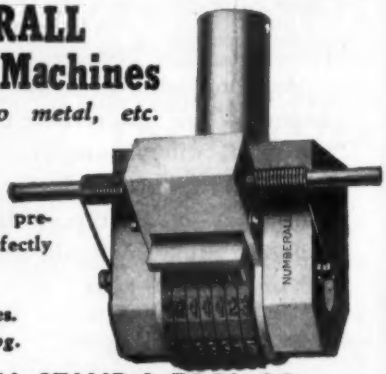
for stamping into metal, etc.

AUTOMATIC MODEL NO. 50



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All sizes of figures.
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GROUND FROM THE SOLID

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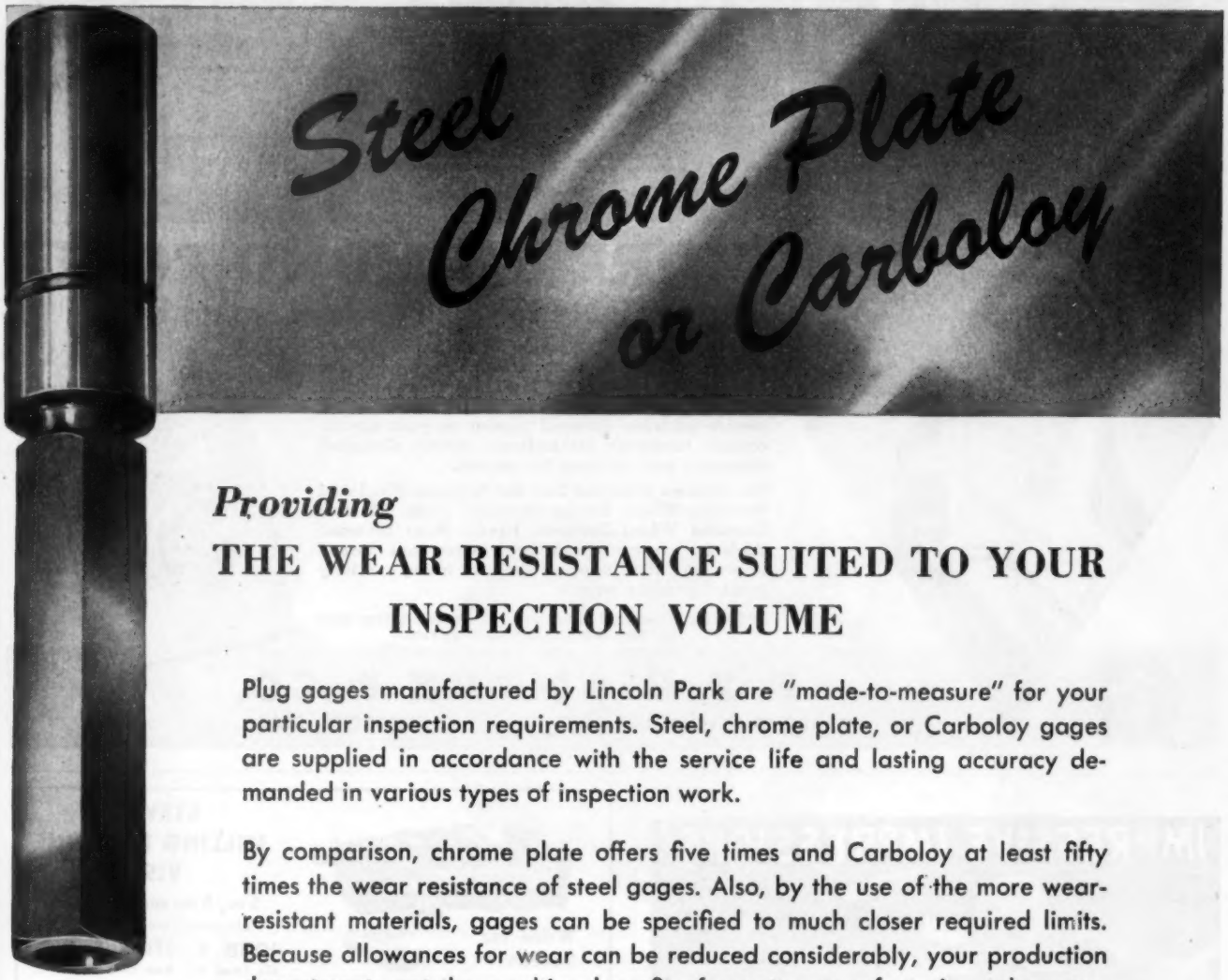

Providing

THE WEAR RESISTANCE SUITED TO YOUR INSPECTION VOLUME

Plug gages manufactured by Lincoln Park are "made-to-measure" for your particular inspection requirements. Steel, chrome plate, or Carboloy gages are supplied in accordance with the service life and lasting accuracy demanded in various types of inspection work.

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In the production of Lincoln Park gages, careful control in grinding and lapping produces gages with extremely high finish—a guarantee of maximum inspection life. Class XX and X gages are finished with Profilometer readings no greater than 1.5 microinches. Readings no greater than 2.5 microinches are guaranteed on Class Y gages.

Prompt delivery of any type of plug gage you require can be promised by Lincoln Park. See your Lincoln Park sales representative or write directly to the plant.

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Successor to The Lincoln Park Tool and Gage Company and Carbur, Inc.

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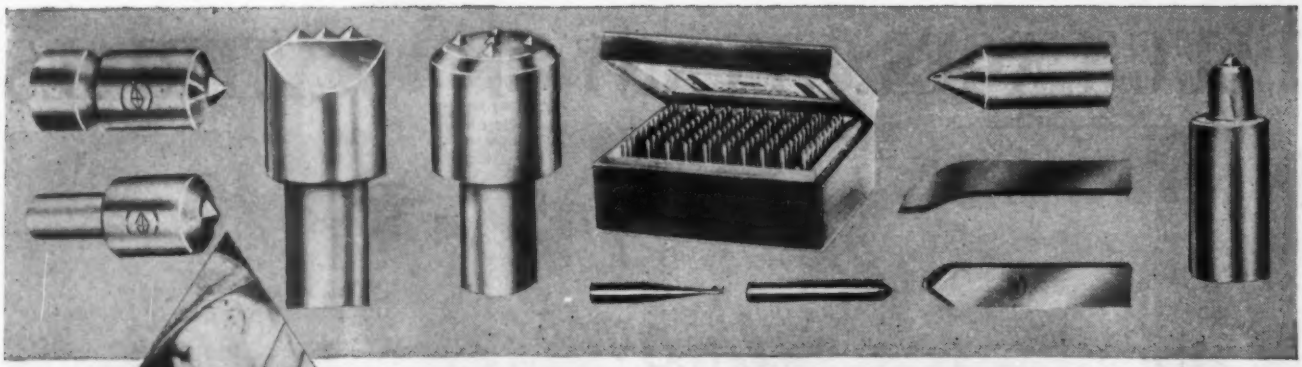

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are available for every wheel truing need

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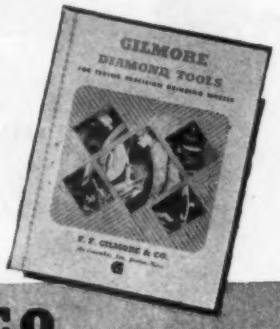
Write for illustrated literature giving full information on the Gilmore line and service.



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All parts Interchangeable
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TANTUNG CUTTING TOOLS — DIES 430

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AEROMAC CUTTERS with CARBOLOY TIPS are the Answer to Many a Production Milling Problem

LOOKING for new production speed and efficiency in your milling operations involving steel, cast iron, non-ferrous and other materials? These skillfully designed Aeromac tools are ready to tackle your assignments—with proven accuracy and economy.

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for rigid inspection of a wide range of parts . . .

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Can be supplied with sliding head and table; also on a stand with throat 3" deep.

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Lubrication Problems

WITH "CORRECT LUBRICATION"

Get Quick "Sparkouts," Greater Production!

FOR QUICK SPARKOUTS that mean greater production, the spindle of a precision grinder should not change alignment in its bearings—by even the smallest fraction of an inch—when the wheel bites into the work.

This means that the bearings should be so tight on the spindle that almost "zero clearances" result.

What a job here for lubricating oil! In spite of its very light body, it must have high lubricity to protect against wear, and maximum stability to prevent formation of deposits.

In numerous plants all over the country, Gargoyle Vacuoline Oils are meeting these special requirements. They are helping operators get greater production with improved accuracy and finish—and all of this with low maintenance costs.

GARGOYLE Lubricants

CALL IN SOCONY-VACUUM FOR "CORRECT LUBRICATION!"

TURN PAGE

HOW TO SOLVE

Cutting Oil Problems

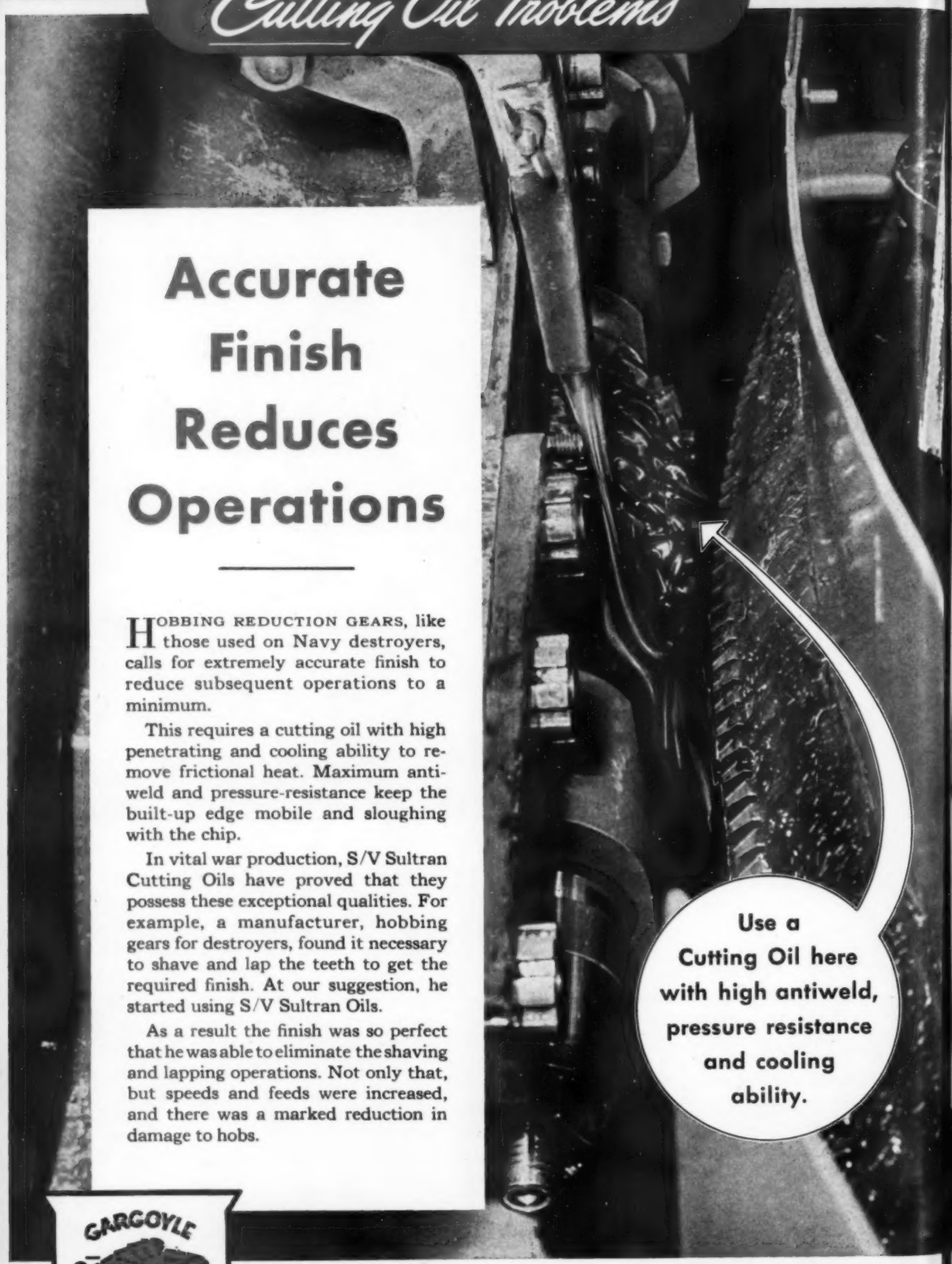
Accurate Finish Reduces Operations

HOBBING REDUCTION GEARS, like those used on Navy destroyers, calls for extremely accurate finish to reduce subsequent operations to a minimum.

This requires a cutting oil with high penetrating and cooling ability to remove frictional heat. Maximum anti-weld and pressure-resistance keep the built-up edge mobile and sloughing with the chip.

In vital war production, S/V Sultran Cutting Oils have proved that they possess these exceptional qualities. For example, a manufacturer, hobbing gears for destroyers, found it necessary to shave and lap the teeth to get the required finish. At our suggestion, he started using S/V Sultran Oils.

As a result the finish was so perfect that he was able to eliminate the shaving and lapping operations. Not only that, but speeds and feeds were increased, and there was a marked reduction in damage to hobs.



GARGOYLE Lubricants

SOCONY-VACUUM

OIL COMPANY, INCORPORATED

HOW TO SOLVE

Quenching Oil Problems

S/V Quenchol "D" Gives Uniform Results Month after Month!

FOR QUENCHING OPERATIONS, where stability and uniform results are the most important factors, S/V Quenchol "D" is the choice of many manufacturers.

This extremely stable quenching oil resists oxidation, cracking and evaporation. Its use reduces deposits of sludge to a minimum and helps keep the whole quenching system clean.

Although it is designed primarily for stability, you'll find that S/V Quenchol "D" provides practically the same "quenching rate" as conventional oils of the same viscosity.

Furthermore, it has minimum tendency to smoke, low evaporation loss and minimum change in body with temperature variations.

Be sure to try this established Socony-Vacuum product for uniform, economical quenching, month in and month out.

This picture shows three workmen quenching alloy bars in a steel plant. In operations like this, S/V Quenchol "D" gives uniform results over long periods of time.

GARGOYLE Lubricants

BACKED BY 78 YEARS' EXPERIENCE IN MAKING PETROLEUM PRODUCTS

We Welcome Your Unusual Lubrication Problems!

Solving them adds to our already vast store of Lubrication Knowledge, gained through 78 years' experience!

SAYS S. R. CROCKER

Industrial Sales Manager, Albany Division, Socony-Vacuum Oil Co., Inc.

OUR RESPONSIBILITY to you, as a customer, is to furnish you with correct lubrication, the right hydraulic fluids and the right cutting and quenching oils for your particular needs.

In order to do this, we sincerely welcome opportunities to investigate your lubrication problems, including the toughest and most unusual.

Solving these problems, as we are doing every day in virtually every industry, adds to our already vast store of lubrication knowledge—knowledge that we have gained through 78 years' experience.

For many years, our Gargoyle industrial lubricants have maintained leadership in industrial and marine operations throughout the world. This position has been attained and held only by painstaking care and accuracy in all of our recommendations.

We like to feel that we are partners with you in your effort to maintain efficient machine operation. If we do our share, we eliminate one of your worries and give you more time for the other perplexing problems that confront you in these abnormal times.

We thank you for your business. In appreciation, we will continue to contribute to your efficient operation with quality products and skilled technical service.

This is one of a series of messages to American Industry from Industrial Sales Managers of Socony-Vacuum Oil Co., Inc.

GARGOYLE

Lubricants

SOCONY-VACUUM OIL CO., INC.

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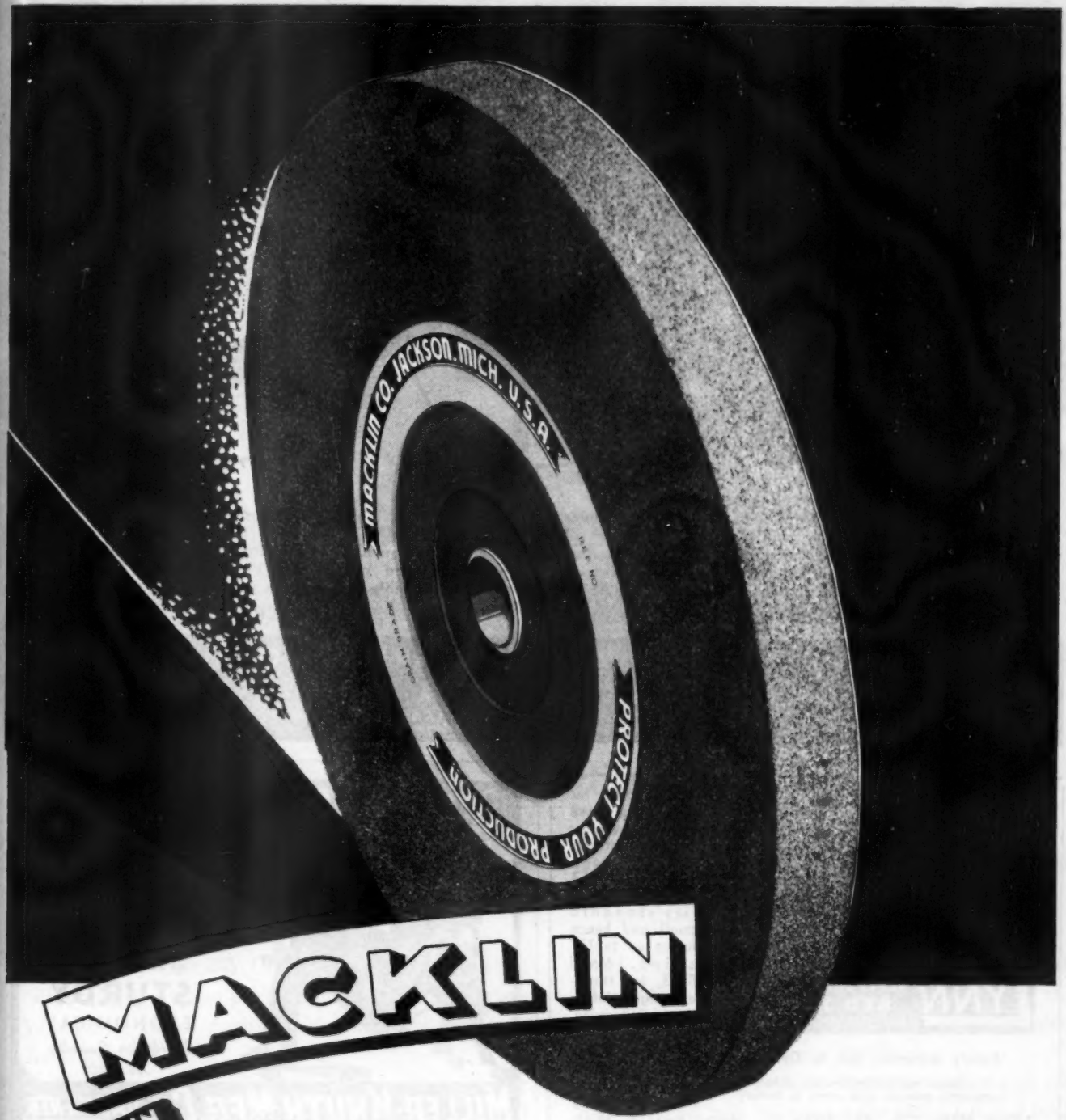

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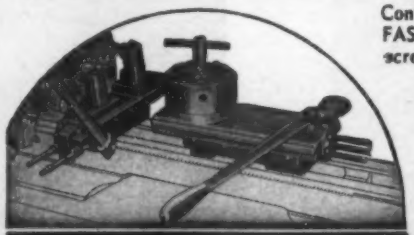

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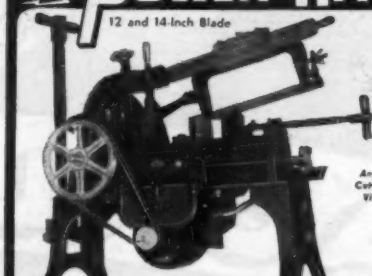

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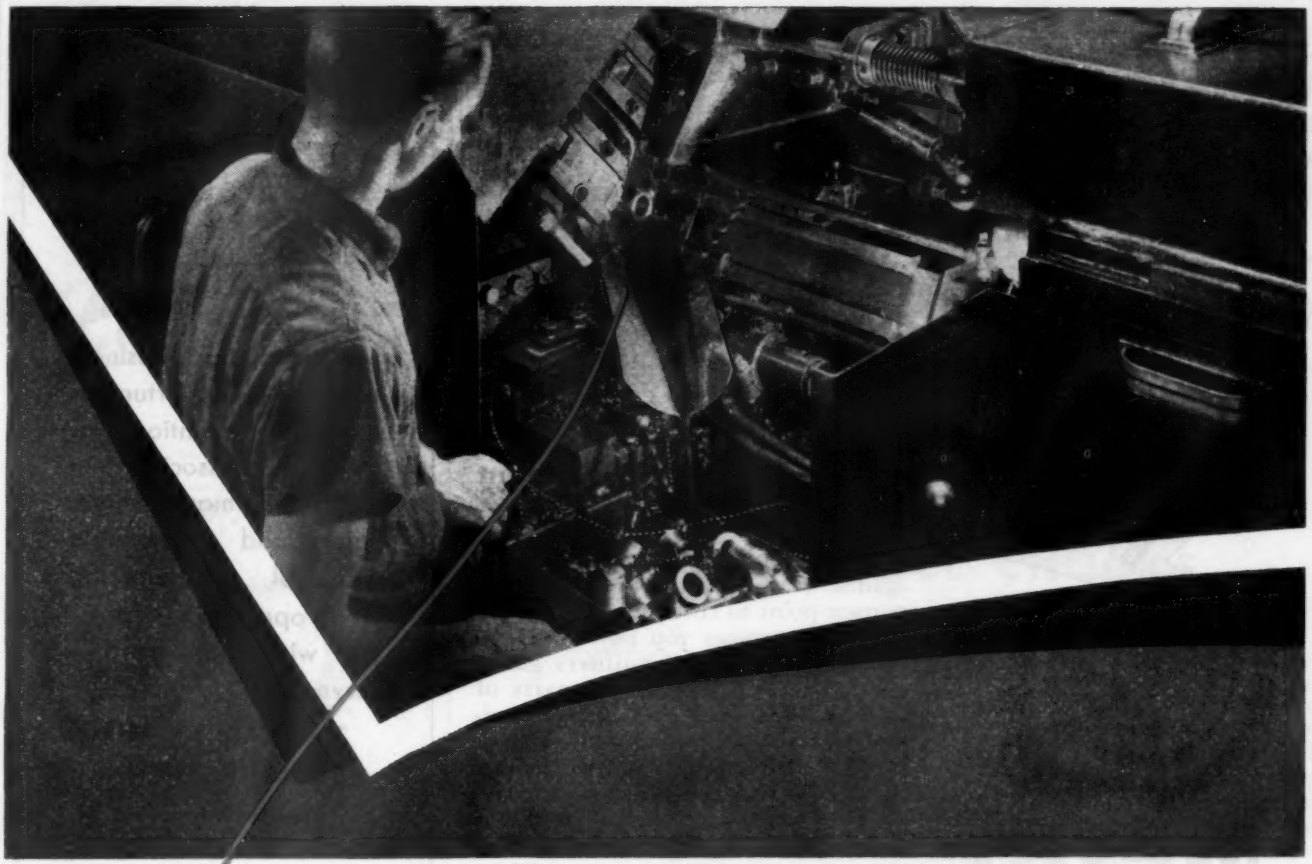

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Gulf Lasupar and Gulf Electro cutting oils, for example. The sulphur in these oils is combined by an exclusive Gulf process so that it is uniquely active over a wider range of temperatures in a cutting operation. This is mighty important in controlling temperatures and insuring precision work, for the advantages derived from the sulphur in cutting oils are governed more by the amount of chemically active sulphur present than by the total percentage of sulphur.

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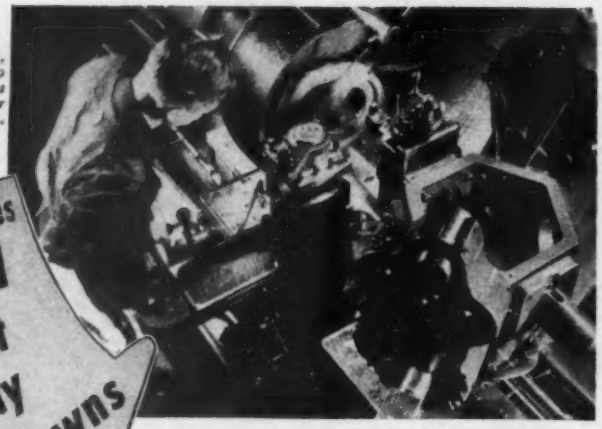

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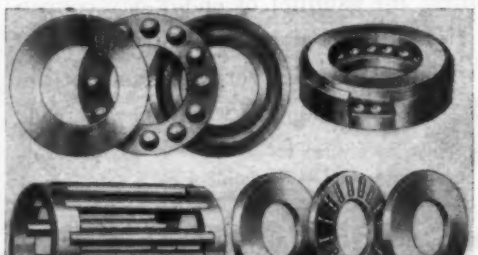

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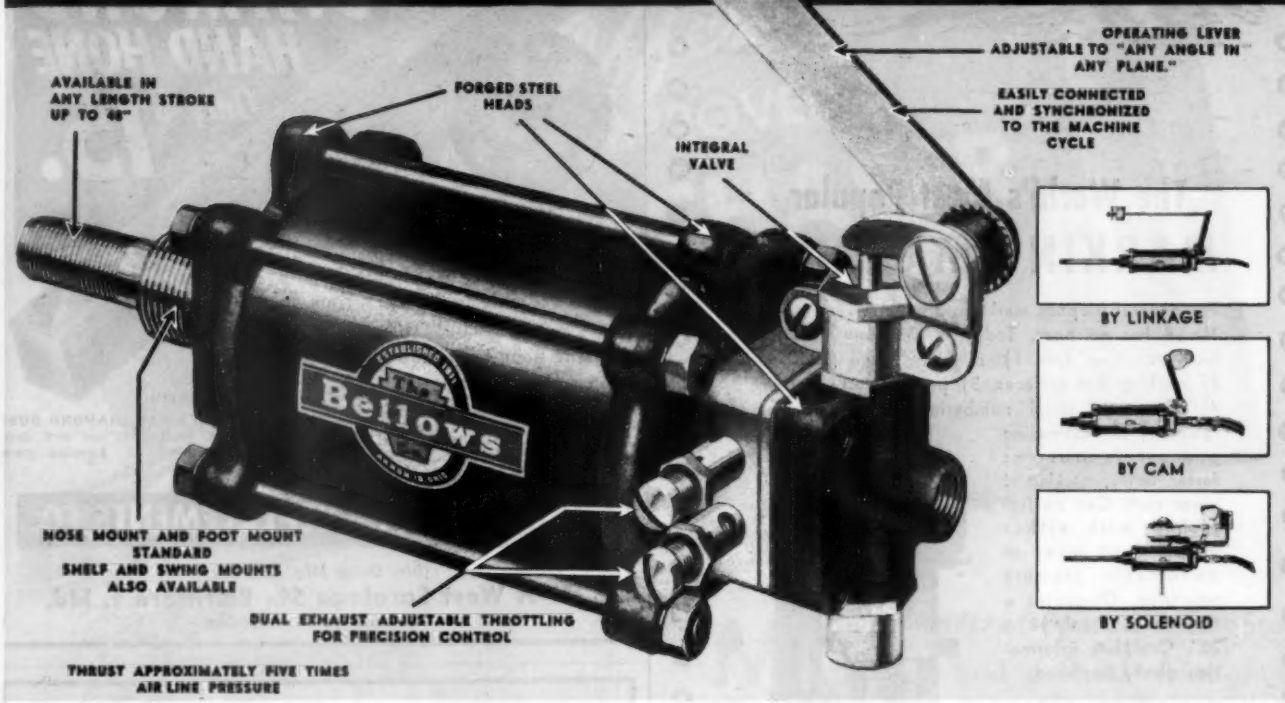
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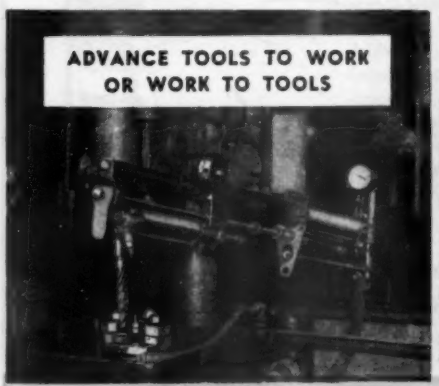

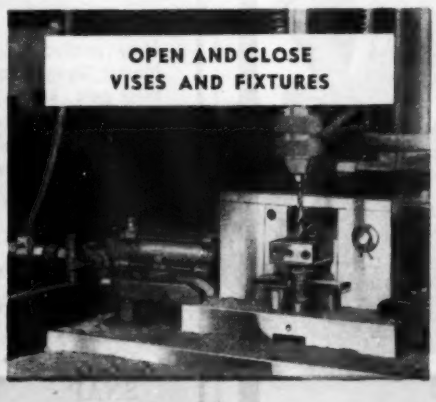

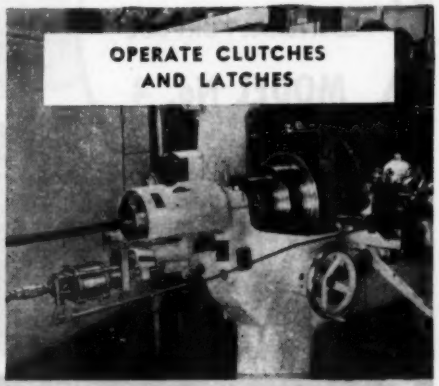

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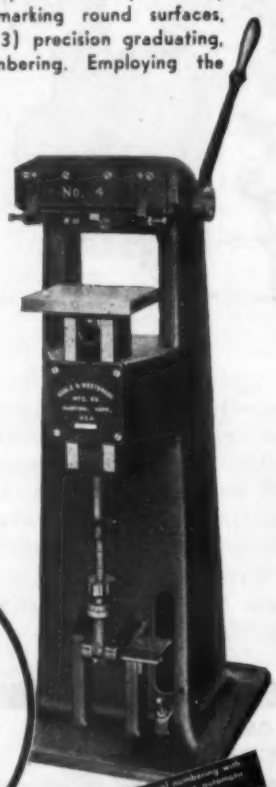

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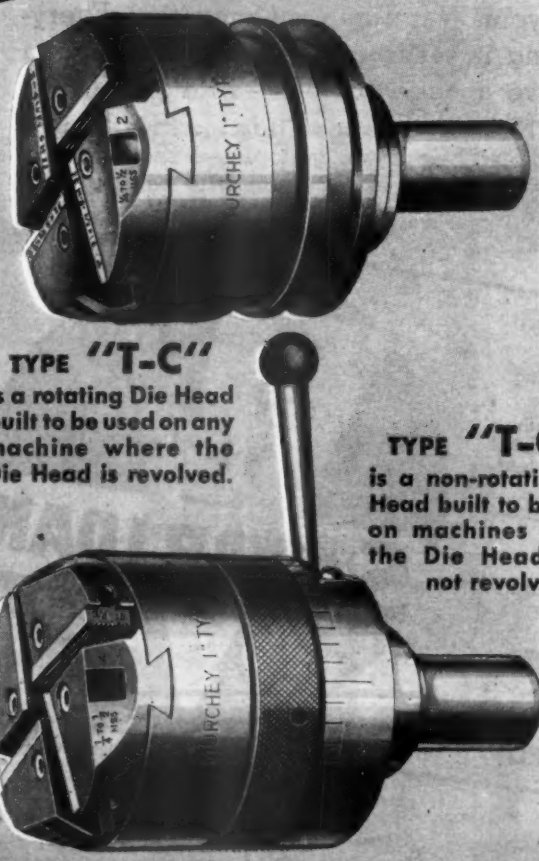

TYPE "T-C" is a rotating Die Head built to be used on any machine where the Die Head is revolved.

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MANUFACTURED of Special Alloy Steel, hardened and ground throughout, these Die Heads (Model "T" series) are expressly made to cut accurate threads on long production runs. They are designed to use Tangent Chasers—giving long chaser life; permanent throat; uniformity of finished work throughout the entire life of chasers and interchangeability of chasers.

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The U. S. Treasury has set the overall goal at $16,000,000,000 — $6,000,000,000 from individuals alone. This is the biggest sum ever asked of the American people—*and it must be raised.*

That's why the U. S. Treasury asks Management and Labor to sit down together and organize—NOW!

For organization—good organization—has been responsible for the excellent showing of the payroll market. And its most important single superiority has been personal solicitation—desk to desk, bench to bench, machine to machine personal solicitation. 71% of all persons on payroll deductions were solicited for the 4th War Loan.

Now, to personal solicitation, add the sales incentive of a definitely established plant quota. Build your campaign around a quota plan. Set up departmental goals. Stress percentage of participation figures. Stimulate group enthusiasm.

In planning your quota campaign, work in close cooperation with the Chairman of your War Finance Committee. Everything is set to make the 5th War Loan drive a huge success—with your help!

(Note: You've read this message. If it doesn't apply to you please see that it reaches the *one* person who can put it in action!)

Here's the Quota Plan:

1. Plant quotas are to be established on the basis of an *average* $100 *cash* (not maturity value) purchase per employee.
2. Regular Payroll Savings deductions made during the drive accounting period will be credited toward the plant quota.
3. 90% of the employees are expected to contribute toward raising the cash quota by buying extra 5th War Loan Bonds: 1—Outright by cash. 2—By extra installment deductions. 3—By extra installment deductions plus cash.

Example: **JOHN DOE Mfg. Co.** — 1,000 Employees

1,000 employees x $100 Regular Payroll deductions during the eight weekly payroll Accounting Periods of June and July = $100,000 Cash Quota

30,000
$70,000 (to be raised by sales of extra Bonds to at least 900 employees)

ORGANIZE • SOLICIT • DELIVER

The Treasury Department acknowledges with appreciation the publication of this message by

AMERICAN MACHINIST

★ ★ *This is an official U. S. Treasury advertisement—prepared under the auspices of Treasury Department and War Advertising Council.* ★ ★

Costs are reduced by High Production

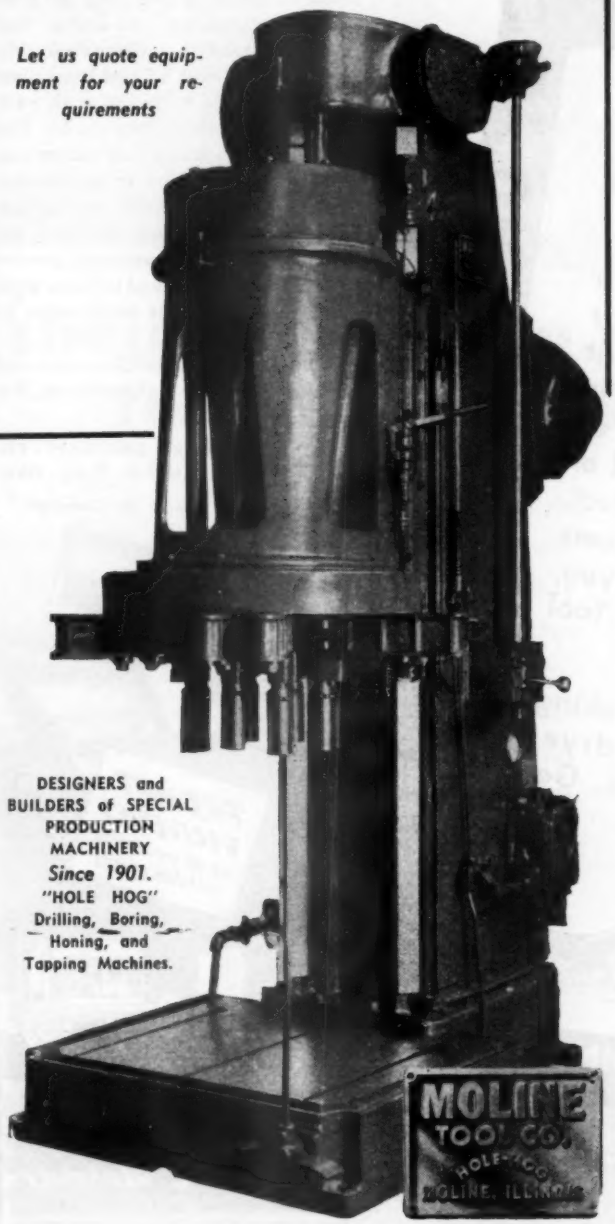
DRILLING

The Moline No. 115-U Hydraulic, Rail-Feed Driller is a rugged, easy-to-operate, heavy duty production tool. The rated capacity of this machine is sixteen ⅝-inch holes in steel or sixteen 1½-inch holes in cast iron.

The No. 115-U as regularly furnished has 16 spindle drivers built into the spindle head gear housing, although a greater or lesser number can be furnished if desired. Four speeds to a gear shift lever, and superimposed on these four speeds is provision for individual adjustment of each spindle driver to either of two speeds or neutral. Each drill spindle is driven by a driver through two heavy universal joints and an extra long seamless steel driving tube which permits maximum adjustment of spindles with a minimum angular displacement and results in longer life of the universal joints. The drilling area covered by adjustment of the spindles as regularly furnished is 18-inch by 36-inch rectangular or 20-inch circular as desired. Other sizes can be supplied.

An automatic operating cycle minimizes fatigue of the machine operator and consists of rapid advance to the work, proper feed, dwell if necessary and rapid return. This type of machine can be arranged for tapping where that feature is desired.

Let us quote equipment for your requirements



DESIGNERS and BUILDERS of SPECIAL PRODUCTION MACHINERY *Since 1901.*
"HOLE HOG" Drilling, Boring, Honing, and Tapping Machines.

STURTEVANT QUALITY

Why be Satisfied with LESS than Sturtevant Quality?

In any operation requiring the accurate control of torque on vital nuts, screws, bolts, hydraulic fittings —of all threaded parts—have the advantages of Sturtevant permanently accurate Torque Wrenches.

1. **Clear faced dials—readable from any angle.**
2. **Permanent accuracy—Longer Life.**
3. **No friction, adjustments moving parts or fragile mechanisms.**
4. **Practically indestructible.**
5. **Sturtevant pioneered design and quality throughout.**

Because Sturtevant Torque Wrenches are PERMANENTLY accurate, the vast majority of torque wrench users standardize on "STURTEVANT".

Over 50 models and types from 0-40 inch ounces to 7200 inch pounds.

NO FRICTION ADJUSTMENTS MOVING PARTS FRAGILE MECHANISMS

P.A. STURTEVANT CO.
ADDISON QUALITY ILLINOIS

23 Foot Weldment BY UNITED

This huge drill base demonstrates the ability of United Welding Co. to handle large, heavy or difficult assignments.

It will be to your advantage to weld as much of your post-war product as possible . . . to make it stronger, yet lighter, and modern in appearance. Look upon United as the logical plant to fabricate all or certain of the parts for that product. Feel free to consult United engineers on designs. Have them quote you. (Send for the United Machine Tool Bulletin.)

Also specialists on paper making equipment—beater rolls, dryer stacks, settling tanks, etc. Get United's Paper Mill Bulletin.

ARMY E NAVY

WELDING ENGINEERS · UWCO · MIDDLETOWN, OHIO

THE UNITED WELDING CO.
MIDDLETOWN, OHIO
WELDING FABRICATORS OF MODERN DESIGNS

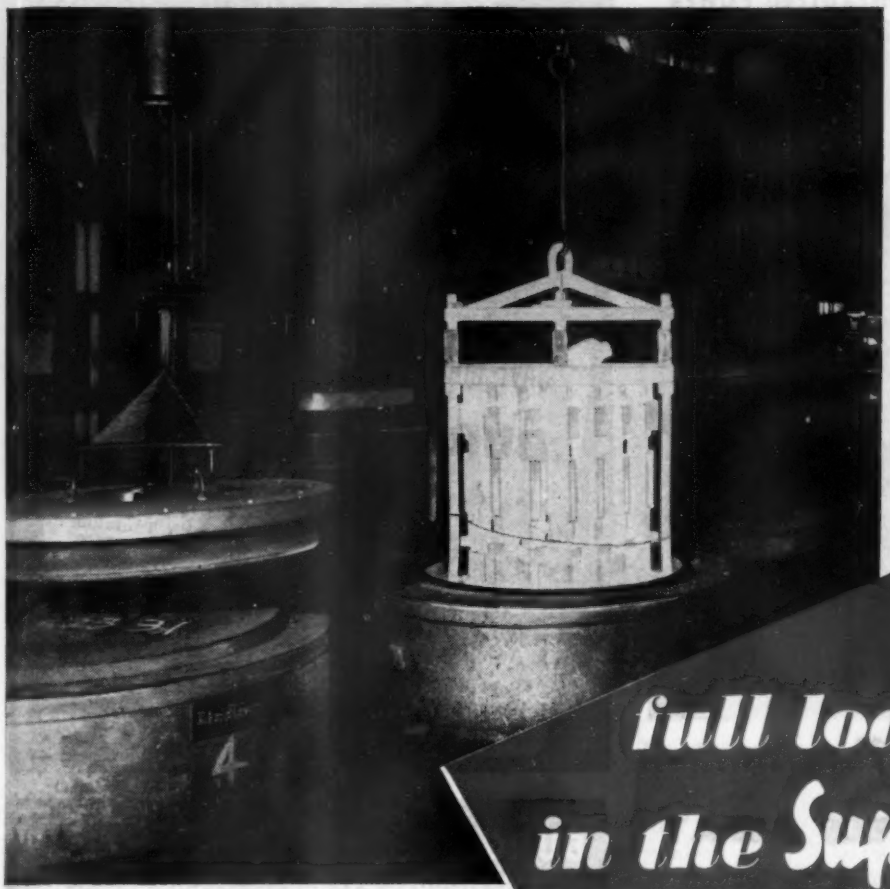
WITH HOBART ARC WELDING AS A BASIC PRODUCTION TOOL ... JUST WATCH OUR "QUICK-CHANGE-OVER" AFTER THE WAR.

Now — Today is the time to plan your reconversion — to decide that welding, today's outstanding production tool, will be used to fullest advantage. To help you with your plans, "Practical Design for Arc Welding," a service that shows you how to use welding in production, will be sent you FREE, no obligation. It's full of ideas, has been acclaimed the most unusual service ever offered. You need it if you work with metal, so write for it today on your letterhead.

HOBART ELECTRODES—a size and coating for every welding need. Ask for details.

HOBART BROTHERS CO.
Box AM-6-8, Troy, Ohio
Send for Catalog!

HOBART
"One of the World's Largest Builders of Arc Welders"



With the charge confined to a small area, fan-driven hot air at high velocity permeates the entire charge evenly, practically eliminating distortion, saving a great deal of space, and allowing quenching of the entire load without removal from the fixture.

heat full loads evenly in the Super-Cyclone

then quench 'en masse' to uniform hardness throughout

The Lindberg Super-Cyclone is a versatile and prodigious worker. Its ability to heat full loads to precise temperatures quickly and evenly throughout the charge increases production greatly, keeps work straighter, and allows in the same furnace either normalizing or annealing, hardening, tempering.

In hardening mass loads it was necessary to design quenching facilities to suit. The Super-Cyclone charge goes directly into the quench where oil is circulated under pressure right through the mass. Ample storage provides fresh cool oil and quenching is uniform throughout the load.

Each charge, fixture and all, is heated and quenched, with a saving in time, man-power and space requirements.

Write for complete information to Lindberg Engineering Company, 2445 W. Hubbard Street, Chicago 12.

LINDBERG FURNACES

ARMY NAVY

SUPER-CYCLONE for hardening, normalizing, annealing, tempering
CYCLONE for accurate, low-cost tempering and nitriding
HYDRYZING for scale-free and decarb-free hardening

INDUSTRY'S NEW SOURCE OF CONTROLLED POWER

Fluid Power

TUCKS THE WHEELS AWAY

On planes, Fluid Power raises and lowers the landing gear. It swings bomb bays open. It revolves turrets—smoothly—quietly—accurately. Fluid Power is transmitted through tubes. No shafts, gears, pulleys or belts are needed.

Industry, too, is discovering that Fluid Power has more than just brute strength. Parker-engineered systems and Parker-built equipment are performing delicate tasks in a wide variety of industries—applications that seem almost limitless.

If you need power for control or drive, don't overlook the advantages of Fluid Power. A Parker engineer will be glad to discuss your problem with you.

A PROVED POWER SYSTEM READY FOR YOUR APPLICATION

Parker - engineered Fluid Power Systems are now in use in the chemical, marine, railroad, synthetic rubber, petroleum, Diesel, refrigerator, machine tool and other industries. New applications are constantly being developed in other fields. Yours may be one of them. A Parker engineer will know. Ask him, or, write direct to The Parker Appliance Company, 17325 Euclid Ave., Cleveland 12, Ohio.

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CUTS COSTS

SAVE MAN HOURS • SPEED PRODUCTION
WITH
BURGESS vibro-tool
(Trade Mark Reg. U. S. Pat. Off.)

Any one can operate! Marks identifying numbers on production parts; engraves names on identification disks instantly; marks on tools, dies, any equipment . . . even hardest steel with Tantalum Carbide needle. CUTS INTO GLASS, RUBBER, CLOTH, WOOD, CARDBOARD, PLASTICS.

Vibro-Tool uses VIBRATION PRINCIPLE, 120 vertical strokes per sec., 60 cycle 110 V A.C. Thousands being used in plants everywhere.

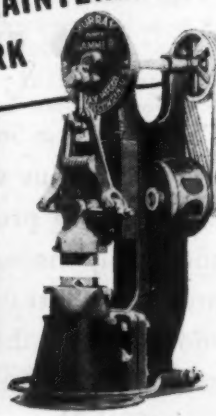
Sold on priority only. Orders filled immediately. Send for sample, or ask for detailed circular.

$7.50 with 20 engraving needles

(HANDICRAFT DIVISION)
BURGESS BATTERY COMPANY
176 N. Wabash Avenue Chicago 1, Ill.

YOU CAN DO EITHER MAINTENANCE OR PRODUCTION WORK

with a
MURRAY POWER DRIVEN FORGE HAMMER



ADAPTABLE for a wide range of light or heavy work, extremely powerful, yet simple in design and so flexible in operation. Murray Power Driven Forge Hammers can be operated under perfect control, with little effort. Built for long, dependable use, with low maintenance cost. The ram design is a special feature. The ram is free from obstruction so that the operator has full vision of the work being done —adjustable for different thicknesses of material and dies. All models can be furnished for motor or belt drive. Complete information upon request. Ask about repair parts service also.

Operated either Electrically or Mechanically

D. J. MURRAY MANUFACTURING CO.
WAUSAU MURCO WISCONSIN
Trade Mark Reg. U. S. Pat. Off.

The Most Important Thing To Look for in Resistance Welding Electrodes is Something You Cannot See . . .

Mallory Experience . . .

Unseen Element Behind the Latest Advancements

Every resistance welding electrode, holder, casting or forging of a Mallory alloy incorporates definite, carefully controlled physical and electrical advantages. Behind these advancements is an invisible element —the plus factor of Mallory experience.

Mallory experience, for instance, formulated Mallory 3 Metal for welding cold-rolled steel faster, more soundly and at lower cost . . . tough Elkonite*, with its extreme hardness for electrical upsetting. Mallory's recommendations on size, construction and contour of electrodes represent accumulated studies dating back to the early days of resistance welding.

Not only does Mallory have electrodes of correct properties for wide and varied industrial requirements, but it places at your service engineering skill to solve unusual and baffling problems. Write Mallory for specific recommendations on how to speed production, cut down welding costs, with better electrodes for spot, seam, flash or projection welding.

*Elkonite is the registered trademark of P. R. Mallory & Co., Inc., for refractory metal compositions.

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

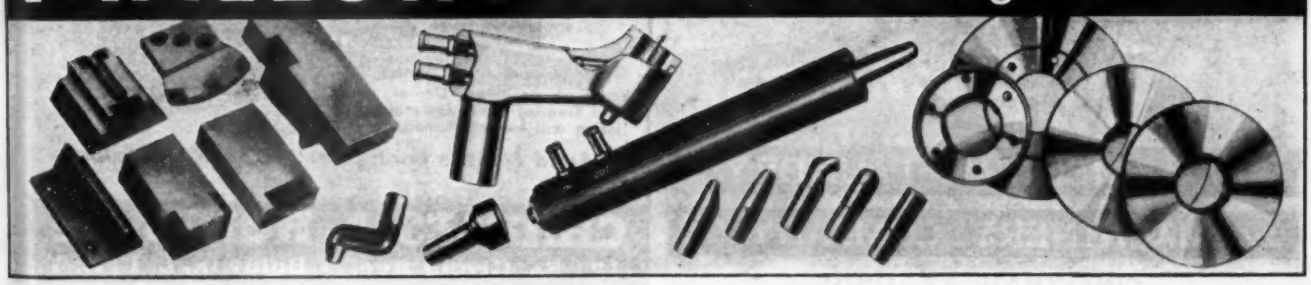
New Mallory Heavy-Duty Holder: **Streamlined, tough, with single piece housing to protect vital inner parts and eliminate leakage troubles. Tip is quickly ejected by hammer blow at opposite end.**

Freedom Is Worth the Price — Buy More War Bonds

ARMY E NAVY

P.R. MALLORY & CO. Inc

MALLORY *Standardized Resistance Welding Electrodes*



$900 saved

Using a Model 26 American Chip Wringer at less than 5% its rated 8-hour capacity, an Iowa manufacturer* is saving 6 gallons of cutting oil every day. At 50c a gallon for the oil, that's $900 saved on a $1000 investment in ONE year (300 days.)

If you use as little as 10 gallons of cutting oil a day, it will pay you to investigate the American Chip Wringer. Can be operated by any unskilled person. Write TODAY for full particulars.

American Chip Wringers are available in the following models: 20, 26, 30, 40, 48.

SEND FOR ILLUSTRATED CATALOGS

*Name furnished on request

ARMY E NAVY

CINCINNATI PLANT

The AMERICAN LAUNDRY MACHINERY COMPANY

CINCINNATI 12, OHIO

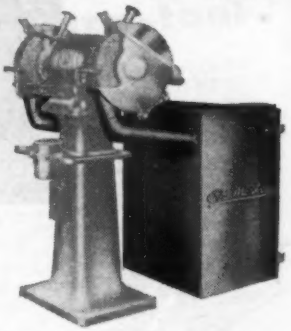
Deadly SABOTEURS Are Operating in Your Plant

—and their names are DUST and GRIT . . . the dust and grit that flies off your grinders and buffers. These deadly saboteurs injure the lungs of your employees, cause breakdowns of expensive machinery by getting into sensitive moving parts and bearings. Eliminate these destroyers of health and machinery by installing the AIR MASTER at each buffer and grinder.

The Cincinnati AIR MASTER sucks up dust and grit right off your grinder and buffer wheels—and does it right at the moment they fly off the wheels. When the AIR MASTER comes in, dust and grit go out!

Fully self-contained . . . efficient, rugged, dependable. A Size For Every Grinder Or Buffer. *Write today for full details.*

NOW AVAILABLE: Two, three and five H. P. grinders and buffers on AA-5 priority or better.



The Cincinnati

ELECTRIC DRILLS • GRINDERS • BUFFERS • PORTABLE TOOLS

The Cincinnati Electrical Tool Co.

3702-5 MADISON RD.

✓ PLAN TO INSTALL

BUZZER

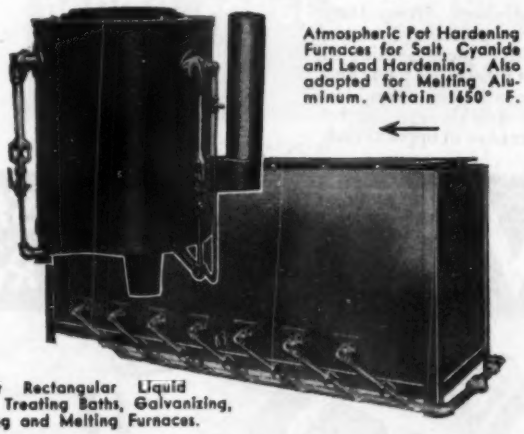
Reg. U.S. Pat. Off.

INDUSTRIAL *Gas* EQUIPMENT

NO BLOWER or POWER NECESSARY

. . . just connect to gas supply

Atmospheric Pot Hardening Furnaces for Salt, Cyanide and Lead Hardening. Also adapted for Melting Aluminum. Attain 1650° F.



Buzzer Rectangular Liquid Heat Treating Baths, Galvanizing, Tinning and Melting Furnaces.

Send for the complete "BUZZER" Catalog

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The "BURROFF"

for

DEBURRING and CHAMFERING HOLES IN FORK SHAPED PARTS

Write for Descriptive Folder and Prices

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Sales Agents
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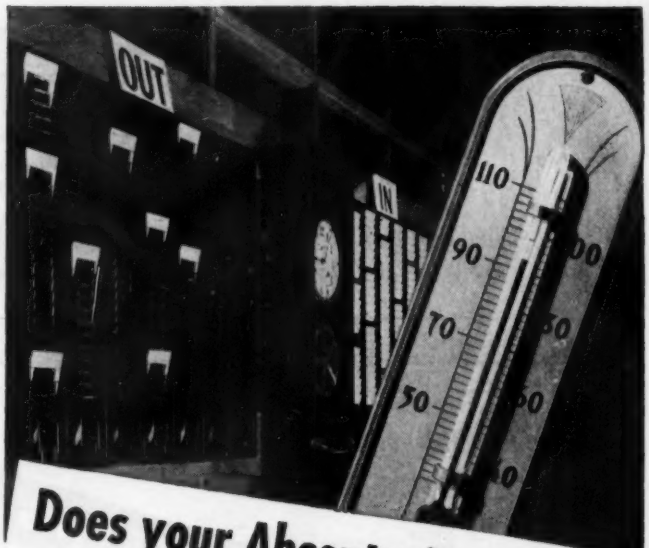
Air Hardening, Non-Deforming, Cobalt High-Carbon, High Chromium Steel

In your change-over and re-tooling operations, we refer your Tool Engineer to PRK-33 Cobaltcrom. This alloy tool steel is the ideal material for extended runs and better production records.

We can ship forged discs and ring forgings promptly.

Bar Stock and Billets in Stock. Drill Rods Furnished on Order.

DARWIN & MILNER INC.
highest grade tool steels
1260 WEST FOURTH STREET
CLEVELAND 13, OHIO



Does your Absenteeism Rise with the Thermometer?

You can hold it down at a cost of 1 cent a man per week

A rising temperature and a rising number of absentees usually go together. One reason is sweat.

Sweat robs the body of essential salt. This loss of salt dehydrates the body. It thickens the blood. Throws body fluids out of equilibrium. The result is Heat-Fag. Workers are tired, easily fatigued. They lack the "drive" that keeps production soaring.

Water alone can't replace the fluids lost through sweat. Water alone in hot, sweaty conditions dilutes body fluids and causes heat cramps.

The real answer is water *and salt tablets* at every drinking fountain. Then workers who do hard work and sweat can take a Morton's Salt Tablet every time they take a drink of water. This is the easy, simple, sanitary way to maintain the proper salt balance. It is recommended by industrial physicians and endorsed by America's greatest corporations. The cost is less than 1 cent a man per week.

This Is What Happens When Sweating Robs the Body of Salt . . .

QUICK DISSOLVING
(Less than 30 Seconds)

This is how a Morton's Salt Tablet looks when magnified. See how soft and porous it is inside. When swallowed with a drink of water, it dissolves in less than 30 seconds.

Case of 9000, 10-grain salt tablets **$2.60**

Salt-Dextrose tablets, case of 9000 . . . . **$3.15**

MORTON'S Heat-Fag SALT TABLETS

Morton's Dispensers

They deliver salt tablets, one at a time, quickly, cleanly—no waste. Sanitary, easily filled, durable.

800 Tablet size - - - $3.25

Order from your distributor or directly from this advertisement . . . Write for free folder.

MORTON SALT COMPANY, Chicago 4, Illinois

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SPECIAL ENGINEERING WORK

. . . on Contract

It will pay you to investigate our facilities. As designers and builders of wire and ribbon stock forming machines we can offer you skilled and experienced assistance. Send us your blueprints or samples for prompt quotations.

We also solicit your bids for cam milling

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ADDITIONAL FACILITIES FOR CONTRACT MANUFACTURING

Hand screw machines up to 1½ dia.
Turret lathes up to 15" dia.
Milling machines
Engine lathes
Bench lathes
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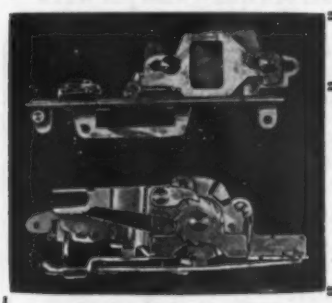
DoALL contour cutting machine

RELIANCE MACHINE & MFG. CO.

30 Irving Place, New York, N. Y.
established 1922



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We can make long or short runs in any metal. Our modern equipment and methods, backed by 50 years of experience, are your guarantee of satisfaction. Our manufacturing facilities also include screw machine products, tools, dies, jigs and fixtures.

"Greater Savings with Greist"

Your order is assured of quality workmanship by skilled mechanics. We will furnish prompt quotations on your blueprints or samples. Write us today!

THE GREIST MFG. CO. 546 Blake Street New Haven, Conn.

METAL STAMPINGS

• TOOLS • DIES •

PERMANENT MAGNETS

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THOMAS & SKINNER STEEL PRODUCTS CO.

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PLANT EMPLOYING 200 PEOPLE HAS PRODUCTION TIME OPEN

- CENTERLESS GRINDERS
- TURRET LATHES
- MILLERS
- SHAPERS
- SUPPORTING EQUIPMENT

Over 200 Machine Tools

BERGEN MACHINE & TOOL CO., INC.

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• TOOL DESIGNING AND BUILDING • MACHINES DESIGNED • IDEAS DEVELOPED • PROMPT—EFFICIENT—SERVICE • • REASONABLE CHARGES •

OLD COLONY ENGINEERING CO.

180 Weeden St. • Pawtucket, R. I.
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Write — Phone or Telegraph

PRECISION FORM GRINDING

Specialists in grinding Circular and Flat FORM-TOOLS, FORM Counterbores, FORM Flat-Drills, and related types of FORM grinding. Also step-grinding of Tungsten and Molybdenum Rods.

Send Prints for Quotation and Delivery

J. & S. TOOL CO.—477 Main St.—E. Orange 1, N. J.
(Makers of J.&S. Radii & Angle Dressing Tools)

MACHINE SHOP Wants Subcontract Work

Facilities as follows: turret lathe to 1½" diameter bar, engine lathe 13" swing by 30" center. Also, milling, drilling, and assembling facilities.

WAYNE MANUFACTURING COMPANY
Telephone 442-R Honesdale, Pa.

QUALITY

SCREW MACHINE PRODUCTS

WALTHAM SCREW COMPANY

WALTHAM • MASS.

WIRE AND METAL SPECIALISTS

in round, flat, square and special shaped wire in all metals.

LARGE PRODUCTION CAPACITY

Plating and finishing.

EASTERN TOOL & MFG. CO.

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Lathes, Milling Machines, Drill Presses, Riveting, Hot Dip Tinning, Jigs and Fixtures. Investigate TODAY.

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PATTERNS in WOOD and METAL

For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY

Put your pattern problems up to us – we will take care of them.

GENERAL PATTERN WORKS

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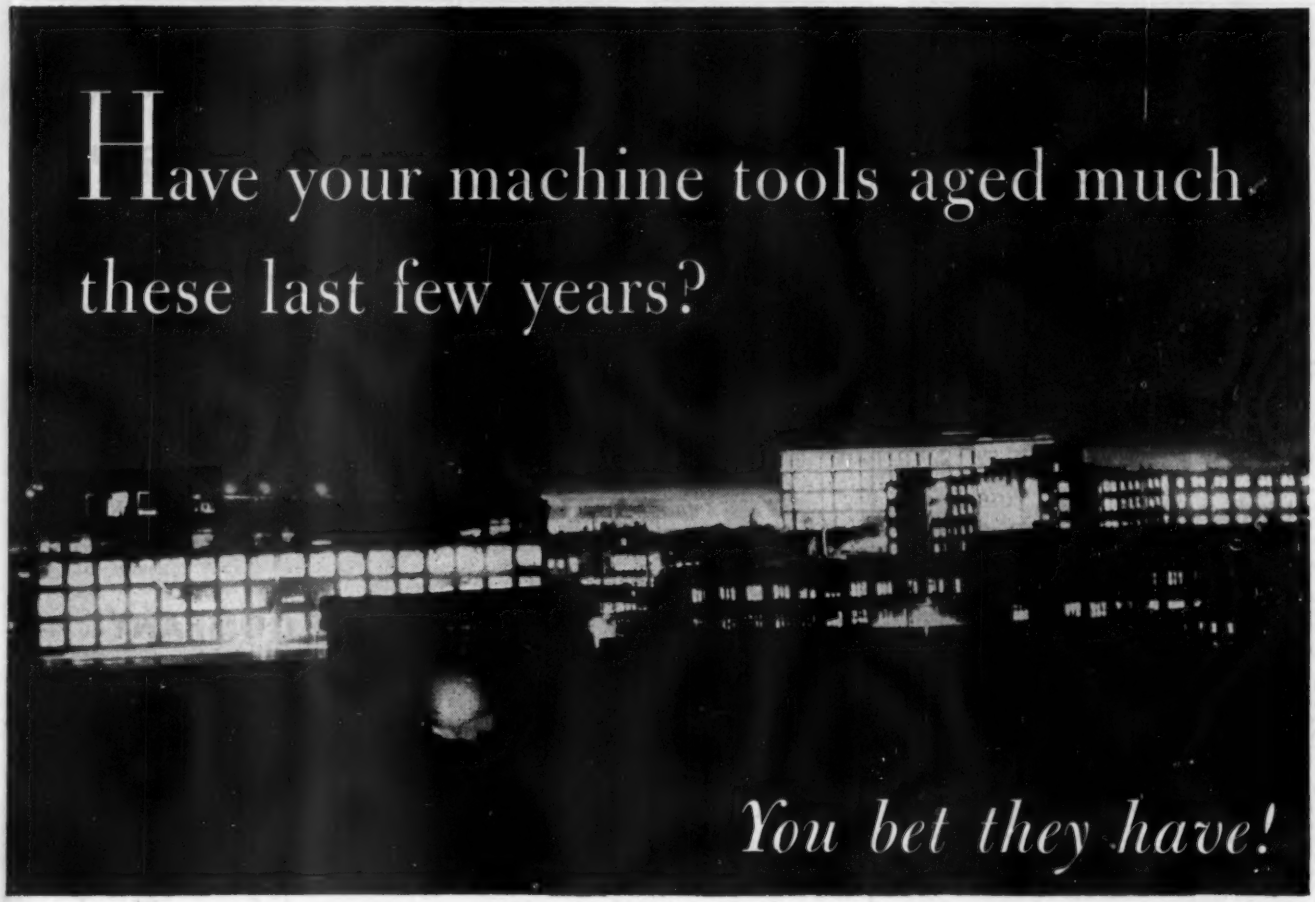
Put Your Idle Capacity to Work

Hundreds of metal-working companies are finding profitable business today outside their regular lines. Tell metal-working America—the 100,000 readers of **American Machinist**—about your facilities. Write for rates.

CONTRACT WORK DEPARTMENT
AMERICAN MACHINIST
330 W. 42nd St., N. Y. 18, N. Y.



You're doing a lot of *thinking* about reconversion...*planning* to get ready for the problems ahead.

Then, why not start right on the floor of your plant? There you will find one factor you can definitely *evaluate and act on now:* your present machine tools. Operating the clock around, often in the hands of unskilled labor, they have compressed years of wear into months, without "time out" even for routine maintenance.

Isn't it logical, then, to take a "physical inventory" of the condition of your equipment and to initiate a systematic program of rebuilding, now?

Many leading manufacturers are doing just that, "furloughing" a few machines at a time and calling on the Simmons Machine Tool Corporation to see the program through.

With thirty-five years of ENGINEERED REBUILDING experience to draw upon, Simmons engineers have developed techniques that not only restore a worn tool to its maximum efficiency, but often "build-in" new utility beyond the originally designed capacity. Lengthened beds or tables, widened housings, special motors and gear transmissions and other labor saving devices, for example.

Result: More efficient and economical plant operation, a vital consideration for the competitive post-war economy.

Have you an unusual rebuilding job? Simmons extensive facilities are adapted to the rebuilding of *any type of machine tool up to the largest sizes.* Simmons has completely rebuilt gun lathes weighing 990,000 pounds each ...the heaviest car wheel lathes, boring mills and planers for leading railroad shops...machine tools of every type and size for steel mills, automotive plants, shipyards and aircraft factories.

Add machine tool rebuilding to your reconversion agenda. You can start today by sending us a list of the machines that require rebuilding. We'll be glad to show you how "The Simmons Way" will facilitate your program.

President

SIMMONS MACHINE TOOL CORPORATION
1759 NORTH BROADWAY, ALBANY 1, NEW YORK

SIMMONS *Engineered* REBUILDING

WANTED

METHODS MAN

Must have mechanical background, familiar with machine tools and light machine work of varied nature. Should be able to function as inspector and generally assist with management in modern Philadelphia plant. Candidate for current war period not essential. We need a young man with progressive ideas who will grow with us. Salary plus opportunity for advancement. State all details.

P-855, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

POSITIONS VACANT

A LEADING OKLAHOMA manufacturer of oil field equipment desires to employ a man in the manufacturing department who is capable of handling time studies, work routing, scheduling, and dispatching production. Address applications to M. G. McCool, American Iron & Machine Works Company, Oklahoma City, Oklahoma.

INDUSTRIAL ENGINEER. Old established machinery builder, modern plant, equipment; permanent, advancement; post war opportunity. Give particulars. P-859, American Machinist, 330 W. 42nd St., New York 18, N. Y.

WANTED BY FOUNDRY group. An experienced man in job rating, time and motion studies, and wage incentive plans. Good salary paid to the right man. State age, experience and salary required. P-860, American Machinist, 330 W. 42nd St., New York 18, N. Y.

SUPERINTENDENT WANTED: By a large, old-established Ohio plant manufacturing tools, jigs, fixtures, and special machinery. Plant is modern and well equipped. This is a permanent position with opportunity for an aggressive outstanding man with ability, and expert mechanical judgment for deciding all problems, salary attractive. Write for interview stating experience, background and when available. P-861, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

EMPLOYMENT SERVICE

SALARIED POSITIONS—This advertising service of 34 years' recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details, R. W. Bixby, Inc., 266 Delaware Bldg., Buffalo, N. Y.

POSITIONS WANTED

PERMANENT POSITION wanted as an assistant to a busy executive or as a factory manager by a 47-year-old, aggressive, mechanical engineer with excellent shop and organization experience and wide knowledge of production methods, processing and tool design. Position must afford plenty of responsibilities. Married, one son and able to locate on short notice. Record and references on request. Perfect knowledge of Russian, French and German languages. PW-806, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

ENGINEER: Graduate industrial, journeymans papers in toolmaking. Desire executive position in war work with post-war future. Employed past three years as tool engineer in ordnance and aircraft work. Age 28, married, draft status 2B, PW-837, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

SUPERINTENDENT, Twenty-five years experience in supervision. Modern methods of tooling and production of medium to large size machinery. Familiar with standards, cost control, foreman training, incentives, etc. Promoter of the "We attitude." Seeks permanent post-war connection. Available. PW-845, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

MANAGEMENT ENGINEER available due to sale of business. Extensive experience in business administration, costs, production, methods and products. Married. University graduate. PW-844, American Machinist, 330 W. 42nd St., New York 18, N. Y.

TOOL SUPERVISOR available; will cut costs, solve manufacturing difficulties, simple, effective tools. PW-829, American Machinist, 330 W. 42nd St., New York 18, N. Y.

(Continued on opposite page)

HELP WANTED

Old established firm making and machining **STEEL CASTINGS** for over 35 years, offers

SPLENDID OPPORTUNITY IN **STEEL FOUNDRIES** and **MACHINE SHOPS** located in Ohio —

SKILLED or UNSKILLED men over draft age or not subject to induction, needed in all departments including —

MELTING DEPARTMENT (ELECTRIC FURNACES)
MOLDING DEPARTMENT
CLEANING ROOM
ROLL DEPARTMENT (MAKING AND MACHINING IRON AND STEEL ROLLS)
PATTERN SHOP (PATTERN MAKERS AND CHECKERS)
HEAT TREATING DEPARTMENT
LABORATORY (CHEMISTS)
IRON ROLL DEPARTMENT (SUPERVISOR)
ALSO SUPERVISORS FOR ALL DEPARTMENTS

Write or apply to —

THE OHIO STEEL FOUNDRY COMPANY
LIMA, OHIO or SPRINGFIELD, OHIO
Must Comply With W.M.C.

ASSISTANT WORKS MANAGER WANTED

Assistant Works Manager wanted for a Diesel engine plant employing approximately 2000 men.

In addition to broad shop experience, must be skilled in handling all other problems including labor relations.

Those employed at their highest skills in war work will not be considered.

State experience and salary required.

Apply P-838, AMERICAN MACHINIST
330 WEST 42nd STREET NEW YORK 18, N. Y.

(POSITION VACANT)
IN CALIFORNIA—DRAFTSMEN AND DESIGN ENGINEERS

Desiring permanent position with well-established manufacturer of small high-speed machines. Leader in industry with future development program always in progress. Must have good background in design of small intricate production parts. If so qualified and interested give background. Apply:
P-811 AMERICAN MACHINIST
68 Post Street San Francisco 4, Calif.

WANTED — TOOLMAKER

who has had enough experience to take charge of tool room on special machine tools, jigs, fixtures, and gages, for our own plant. Excellent post-war opportunity for man who desires to get connected with a progressive concern established in 1938. Factory located on beautiful Lake Shore Drive, in southwestern Michigan. Give all details and salary expected in first letter.
P-701, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

PRODUCTION MAN

Wanted by old established builder of high grade machinery, with highest rating. Permanent connection and unusual opportunity for advancement for experienced producer. Plant and equipment is modern and working conditions congenial. Now on war work but has broad line of nationally recognized post war products. Give particulars as to experience and previous responsibilities. Address

P-841, American Machinist
330 W. 42nd St., New York 18, N. Y.

WANTED

METAL PROCESSING and FINISHING MAN

Technical service organization needs capable man with broad production experience in metal shaping, forming, processing, cleaning and finishing operations. Must have ability to combine his knowledge with application of our materials so essential in all kinds of industries. Headquarters New York. Well-established organization, excellent future for right man.

OAKITE PRODUCTS, INC.
22 THAMES ST. NEW YORK, N. Y.

SPECTACULAR AUCTION SALE!

of MACHINE TOOLS——¼ MILLION $ VALUATION!

FINEST AGGREGATE OF PRACTICALLY NEW AND REBUILT TOOLS OFFERED DURING THIS WAR PERIOD!
MANY PURCHASED AFTER 1941!

TUESDAY, JUNE 27th, 1944—11:30 A. M.

On the Premises 601-619 39TH STREET (COR. 6TH AVENUE), BROOKLYN, N. Y.

These machines were formerly located at the plant of the Textile Finishing Corporation and used for War contracts—but were moved for the convenience of the AUCTION SALE to the above address.

The majority of these machine tools carry Owner's Certificate of Tolerance.

THIS SALE PARTIALLY COMPRISES—

MILLING MACHINES, including: — #4 Cincinnati, Dial Type, Plain, Timken Bearing, Motor in Base; #3 Cincinnati Hi-Power Universal; #3 LeBlond Plain; #3 Cincinnati Plain, Round Overarm; #3B Milwaukee Plain, Timken Bearing, Motor in Base; #3 Cincinnati Dial Type Verticals, Timken Bearing, Motor in Base; (3) #3H Milwaukee Verticals, Timken Bearing, Motor in Base; #2BS Milwaukee Plain, Timken Bearing, Motor in Base; #2 Van Norman Plain; #2 Brown & Sharpe Vertical; #2A Brown & Sharpe Universal; #2B Brown & Sharpe Plain; #2 Cincinnati Universal.

BORING MILLS: 54" Cincinnati, Hypro, P.R.T., 5 Individual Motors (used 3 months); 24" Bullard Rapid Production.

RADIAL DRILLS: (2) 5' Carltons, Type 3A, Motor on Arm; 6' Cincinnati Bickford, Gear Box Motor Drive.

GRINDERS: #16 Blanchard, Motor Driven; (2) #70 Heald Internals; 12x36" Diamond Surface; 12x24" Diamond Surface. #30 Bryant Int'l M.D.

No priorities needed! A rare opportunity to fulfill your machine tool needs!

LATHES, including: — (2) 27"x8' American Super Productive, Timken Bearing; 36"x20' American, Geared Head, Timken Bearing; 27"x16' Lodge & Shipley Geared Head, Timken Bearing; 25"x18' LeBlond, Geared Head, Timken Bearing; 24"x16' Lodge & Shipley, Geared Head, Timken Bearing; 27"x18" LeBlond, Geared Head, Timken Bearing; 24"x12' American, Geared Head; 22"x10' LeBlond, Geared Head, Timken Bearing; (4) 24"x12' LeBlonds, Geared Head, Timken Bearing; (4) 20"x12' Fay & Scott; 20"x12' LeBlond, Rapid Production; 20"x10' LeBlond, Rapid Production; 14"x6' Monarch, Geared Head, Timken Bearing; also Hendeys, Reeds, South Bends, and many other lathes.

SHAPERS: 28" Gould & Eberhardt, V Ram; 20" Kelly.

TURRET LATHES, including: — (2) #2A, (2) #3A, (1), #1A, (1) #4 and #6 Warner & Swaseys; Fosters, Bardons & Olivers.

INSPECTION: JUNE 19, to Date of Sale . . . EVERYTHING WILL BE SOLD IN PIECEMEAL LOTS
For All Information and FREE DETAILED CIRCULAR Write — Wire — Phone

To Industrial Plants Corporation

Auctioneers — Appraisers — Liquidators

90 WEST BROADWAY, NEW YORK 7, N. Y. **BArclay 7-4185** **(Ohio Office: Ohio Bldg. Toledo)**

POSITIONS WANTED

(Continued from opposite page)

MANUFACTURING EXECUTIVE seeks new connection as Factory Manager or Executive Engineer with firm producing intricate mechanical-electrical devices. Experience includes 22 years with prominent business machine and industrial instrument companies. Proven record as good organizer and producer. PW-856, American Machinist, 68 Post Street, San Francisco, Cal.

MACHINIST, experienced tools, dies seeking connection machine tool manufacturer. I have ideas for development special purpose lathe, miller. PW-862, American Machinist, 330 W. 42nd St., New York 18, N. Y.

TOOL AND PRODUCTION engineer, expert on tooling machinery and production methods. Aggressive, exceptional organizer and systematizer with 37 years experience. Precision work preferable. Position must be permanent. PW-857, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

SALESMAN WANTED

SALESMAN for metropolitan New York, precision tools and tool holders. Experience in the use of these tools or knowledge of them necessary. Salary and commission. SW-849, American Machinist, 330 W. 42nd St., N. Y. 18.

REPRESENTATIVE AVAILABLE

A MANUFACTURER'S AGENT well established in the Chicago trade area with an enviable sales record in the cutting tool field, desires an additional line. A graduate engineer, competent and experienced sales and service. RA-863, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

PATENT ATTORNEY

PATENTS, COPYRIGHTS, Booklet, "General Information concerning Inventions and Patents" and "Fee Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N. W. Washington 5, D. C.

WANTED

MACHINE AND TOOL SALESMEN

EXCEPTIONAL OPPORTUNITY FOR HIGH GRADE EXPERIENCED MEN TO EXPAND INCOMES HANDLING HIGH QUALITY WELL KNOWN CUTTING OILS AND LUBRICANTS. FULL COOPERATION ASSURED. ATTRACTIVE COMMISSION. *WRITE COMPLETE DETAILS.*

SW-840, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

MANUFACTURER'S REPRESENTATIVE

Desires contact with interested manufacturer of any articles to wholesaler, jobbers, retailers for New York and eastern seaboard. 20 years experience in sales and promotion.

MELAIRE DISTRIBUTING CO.
420 Lexington Ave. New York 17, N. Y.

Established

MANUFACTURER'S AGENT

With long standing connections in the Automotive and Aircraft industries as well as others in the State of Michigan wishes to acquire representation of an established product of merit.

RA-853, AMERICAN MACHINIST
520 North Michigan Ave., Chicago 11, Ill.

CONTRACT WORK

MANUFACTURING FACILITIES WANTED: Forging, cold heading or punch press shop wanted to make several million pocket knife bolsters for us. Write for samples. Union Cutlery Co., Inc., Olean, New York.

MANUFACTURING—Metal Working Machine Tools. Machine tools, jigs and fixtures designed and selected. Clifford B. Bogle, Maryville, Tennessee.

FOR SALE

Manufacturing Business, item; Safety Guards for Power Presses; orders on hand; opportunity for Mechanic. Price Seventy-Five hundred ($7500.00) dollars.

STANDARD SAFETY MFG. CO. INC.
865 Congress Avenue, New Haven, Conn.

1—Brown and Sharpe #34 Gear Hobber Motor Driven.
1—Cincinnati-Bickford 4' Radial Drill
1—Norton Cylindrical Grinder, 12 x 18, Motor Driven.
1—Coulter 24" Crank Planer, motor driven
1—Stockbridge 18" Single Pulley Drive Shaper
1—Heald #22 Rotary Grinder
1—#75 Heald Internal Grinder
150 other machines.

THE STATE MACHINERY CO., INC.
865 CONGRESS AVENUE
NEW HAVEN, CONN.

NEW INVENTIONS WANTED

Mechanical and electrical devices for post-war manufacture and sale. Either new ideas, or improvements upon present methods.

P. O. Box 217, Denville, N. J.

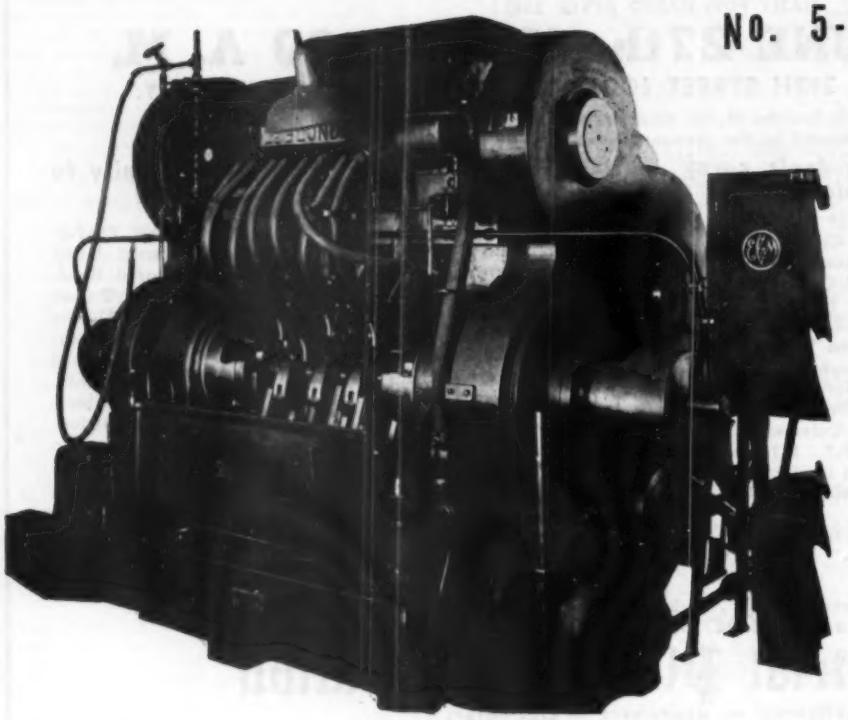
WANTED

1 Screw Cutting Lathe up to 14"—1 B. & S. Mill—1 B. & S. Surface Grinder #2 or Norton—1 J. & L. Comparater with graduations—1 Rockwell Tester, late models only.

W-852, AMERICAN MACHINIST
330 West 42nd St., New York 18, N. Y.

ADDITIONAL WANTED ADVERTISING ON PAGE 321

EMERMAN CHICAGO



No. 5-AC LEBLOND AUTOMATIC CRANKSHAFT LATHES

We have four of these machines available. Two will handle shafts 40″ long and will turn eight pins simultaneously. The other two will handle shafts 32″ long and turn six pins simultaneously.

Hydraulic chucking.

Completely automatic

Motor driven

(Four available in stock for inspection and immediate delivery)

No. 4-AC LEBLOND CRANKSHAFT LATHE—AUTOMATIC

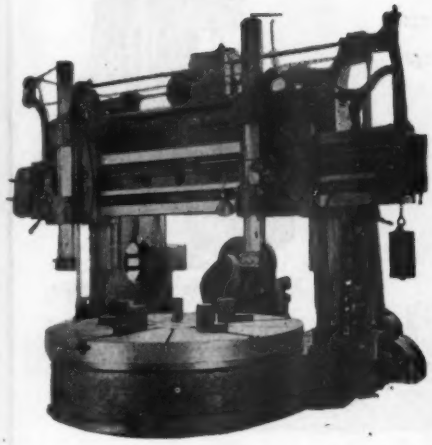
Center drive
Swing 18″
Distance between centers 48″
Equipped with two tool slides in front and two in rear
Arranged for geared motor drive
Equipped with air hoist and rail for loading and unloading work
Primarily used for production turning of line bearings on crankshafts
Can be tooled up for turning multiple diameters on any type of shafts

(Available in stock for inspection and immediate delivery)

EMERMAN MACHINERY CORP.
875 West 120th Street,
Chicago 43, Illinois

IMMEDIATE DELIVERY

"FALK" for DEPENDABILITY in Rebuilt Machinery



100" Niles-Bement-Pond Boring and Turning Mill.

BORING MILLS

100" Niles-Bement-Pond Boring and Turning Mill.
Vertical, 48" Gisholt.
Vertical, 52" Colburn.
Vertical, 42" "New Era" Bullard.
Vertical, 60" Colburn.
Horiz. #36 Landis-Rochester, 3½ Bar Floor Type—Floor Plate 72" x 120".

COMPRESSORS

15 hp. Direct connected Motor Drive A.C. 60 cyc.
8 x 8 Bury Horizontal.
8 x 8 Sullivan.
6 x 8 Bury.

RADIAL DRILLS

4' Arm Cincinnati Bickford.
5' Arm 11" Rd. Col. Cincinnati Bickford.
5' Arm 13" Rd. Col. Cincinnati Bickford, air clamp.
7' Arm 15" Bickford.

MILLING MACHINES

No. 3 Cincinnati, High Power, Plain with Vert. Head & Rotary Table, M.D.
No. 5 Cincinnati, High Power, Plain, S.P.D.
No. 4 Cincinnati, High Power, Plain, S.P.D. (2).
No. 3 Cincinnati, High Power, Vertical.
No. 2 Cincinnati, High Power, Plain.
No. 2 Cincinnati, Motorized, Pyramid Col.
No. 2 Brown & Sharpe, Plain (10).
No. 1½ Brown & Sharpe, Plain (2).
No. 1½ Valley City Universal, Cone Dr.
No. 1 Brown & Sharpe, Plain (6).
No. 12 P & W Lincoln Type Production (2).
No. 00 Bickett and Miller.
No. 0 Bickett Vertical Bench Miller.
Ames Precision Universal Bench Mill.
P & W 2" Duplex Spline Miller.
Hall Planetary Thread Miller 24"
No. 8 Lees Bradner Thread Miller.

No. 3 Cincinnati High Power, Vertical.
1—Brown & Sharpe #2 Vertical Miller, single pulley drive.

ANGLE BENDING ROLL

Bertsch 3" x 3" x ⅜".

PLANERS

120" x 72" x 35' Betts, 4 Heads, M.D.*
72" x 72" x 18' Pond Heavy Pattern, 4 Heads.
48" x 48" x 12' Putnam Heavy, 2 Heads, M.D.
30" x 30" x 12' American M.D., 2 Heads.
30" x 30" x 10' Cincinnati Heavy Pattern, 2 Hds.

PLANER - SHAPER

20" x 20" x 36" Niles-Bement-Pond, M.D.

BRAKE

203 Dries & Krump Apron Type, Motor Dr., 10' x 11 Ga.

SHAPERS AND GEAR CUTTERS

16" Queen City M.D.
7" Rhodes Horiz. High Speed, Belt Dr.
26" Cincinnati Triple Geared Belt. Dr.
612 Fellows 36" Gear Shapers, (2)
24" Schuchart & Schulte.
14" Steptoe, M.D.

GRINDERS

16" Heald Rotary Surface Grinder.
12" Persons-Arter Rotary Surface Grinder.
12" Heald Rotary Surface Grinder also equipped with 9" Dia. Permanent Magnetic chuck.
2 Brown & Sharpe 10" x 30" Univer. Cylindrical Grinder, belt drive.
2 Cincinnati Centerless Grinder, Filmatic.
12 Greenfield Hydraulic Internal Grinder.

AUTOMATIC

Davenport Model "B" High Speed, 5 spindle 9/16" cap. Threading spindle, complete, perfect condition.
#0 Brown & Sharpe full Automatic Motorized, Serial 5721.

LATHES

Monarch 10" x 8' Q. C. G. with Taper Attachment and Chuck.
South Bend 16" x 6' Motorized Gap Lathe.
Rockford 16 x 8 Toolroom Lathe, Taper, Chucks, M.D.
LeBlond 21 x 8 High Duty, Taper, Chuck, M.D.
LeBlond 21" x 16' High Duty, Taper, Chuck, M.D.
Schumaker & Boye 20" x 10' QCG**, Taper, Chuck, Belt Dr.
Putnam 26 x 12 Heavy QCG, arr. for M.D.

Headquarters for Punch Presses

THIS IS A PARTIAL LISTING OF OUR STOCK. SEVERAL HUNDRED ADDITIONAL ITEMS IN STOCK. SEND US YOUR INQUIRIES.

**Quick change gear

*Motor Driven

Buy from Stock

MACHINERY

Tel. Main 6347-6348

FALK

MACHINERY CO.,

18 WARD ST.

MERCHANTS

ROCHESTER 5, N.Y.

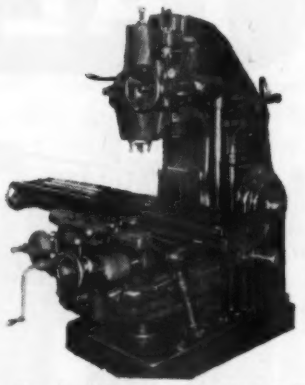
PRACTICALLY NEW MACHINE TOOLS

2 YEARS OLD—LESS THAN 6 MONTHS' SERVICE

ALL A. C. MOTOR DRIVEN—IMMEDIATE DELIVERY

MILLING MACHINES

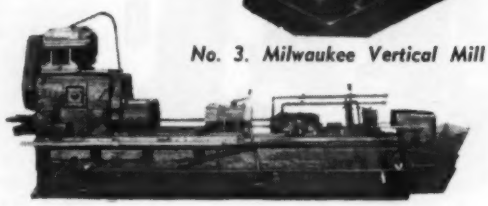
No. 3 Cincinnati Plain
No. 4 Cincinnati Plain
No. 2 Jackson Vertical
No. 4H Milwaukee Plain
No. 4H Milwaukee S.H. Vertical
No. 4K Milwaukee S.H. Vertical
No. 3H Milwaukee S.H. Vertical



No. 3. Milwaukee Vertical Mill

GRINDERS

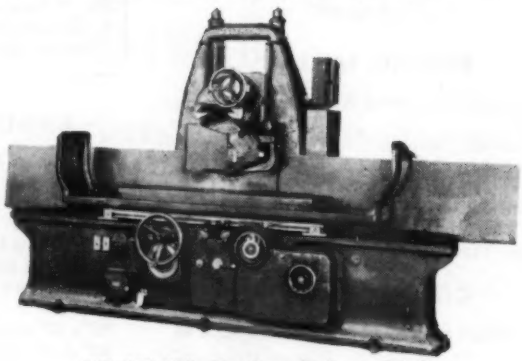
12" x 16" x 60" Mattison Surface
No. M 3 Abrasive Vertical Surface
No. 2 Cincinnati Tool & Cutter
10 x 72 Hill Clarke Cyl.
72A5 Heald Internal
No. 5 Grand Rapids Tool & Cutter
No. 510 Oliver Drill Pointer
No. 21 Oliver Drill Pointer



No. 420. Barnes 2 Spindle, Deep Hole Drill

DRILLS

No. 420 Barnes 2 Spindle Deep Hole
Stecker Vertical Deep Hole
Natco one way horizontal, Hydraulic
4'-11" Col. Carlton
3'-9" Col. American
No. 4 Colburn 2" Cap.
No. 2 Foot Burt 8" O.H.



12"x16"x60" Mattison Surface Grinder

LATHES

No. 2A Warner & Swasey
No. 3A Warner & Swasey
17" x 52" LeBlond Production
18" x 72" Monarch, Tool Room
24" x 14' Monarch

VERTICAL SHAPER

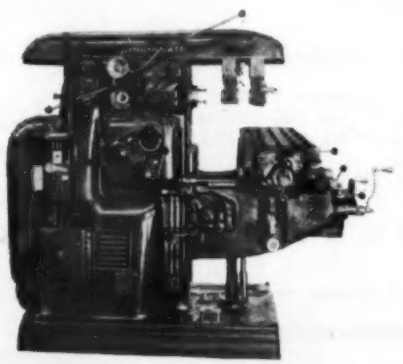
6" Pratt and Whitney, Model B

THREAD MILLERS

6" x 60" Pratt and Whitney
6" x 80" Pratt and Whitney

MISCELLANEOUS

36" Jarecki Hand Screw Press
2000 Lbs. Shaw Electric Hoist



No. 3. Cincinnati Plain Mill

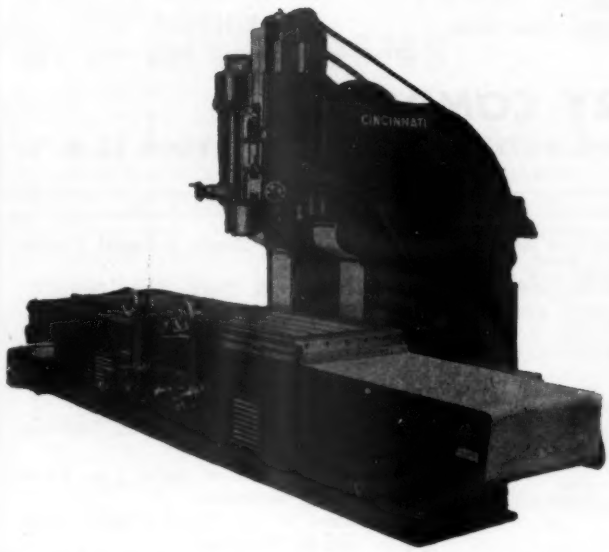
George M. Bernstein & Co.

12 SO. CLINTON STREET — CHICAGO 6, ILLINOIS

LATEST TYPE MACHINES FOR IMMEDIATE SHIPMENT

No Priority Required

MACHINES 2 TO 3 YEARS OLD



No. 28-60 CINCINNATI VERTICAL HYDRO-TEL MILLING MACHINE

1 No. 28-60 Cincinnati Vertical Hydrotel Milling Machine, motor drive, with A.C. 220 volt, 3 phase, 60 cycle electrical equipment. Machine is equipped with spindle reverse, extended cross travel of ram, extended vertical range, power feed to vertical head, coolant pump

1 No. 34-36 Cincinnati Plain Hydromatic Miller, with A.C. motors

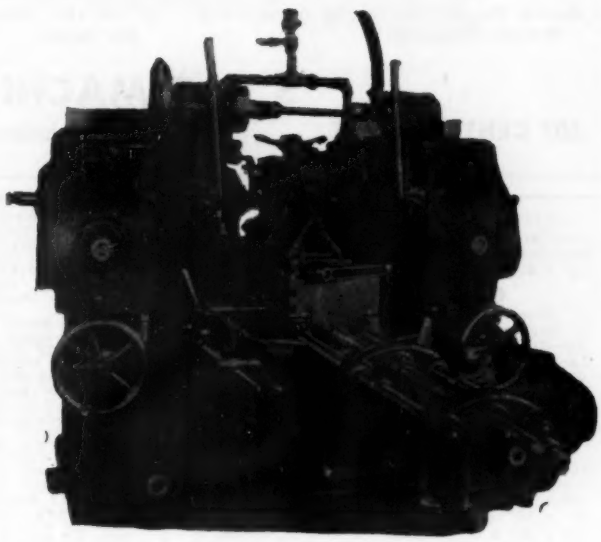
1 No. 34-36 Cincinnati Plain Hydromatic Miller, with A.C. motors

1 No. 4-36 Cincinnati Plain Hydromatic Miller, with A.C. motors. See cut

4 No. 34-36 Cincinnati Duplex Hydromatic Millers, with A.C. motors

3 No. 34-36 Cincinnati Duplex Hydromatic Millers, with tracing attachment, A.C. motors

1—72" King New Type Heavy Duty Vertical Boring & Turning Mill, motor drive, with A.C. motors. Machine is equipped with right hand swivel turret, left hand swivel ram, right hand side head, plain table, tool lubricating attachment, 1 set of 4—12" steel body face plate jaws.



CINCINNATI HYDROMATIC MILLING MACHINE

1 Type A Barber-Colman Gear Hobber, with A.C. motor

1—10x96" Landis Type C Plain Cylindrical Grinder, with A.C. motors

No. 4 Hammond Chip Breaker & Grinder, motor drive

2 No. 4DE Potter & Johnston Automatic Chucking and Turning Machines, with A.C. motors, chucking equipment

1—6 spindle Edlund Drill, m.d. with power feed

1—6 spindle Avery Drill, m.d.

1 No. 4 Motch & Merryweather Cold Saw, m.d.

1 Saw Grinder for Motch & Merryweather Cold Saw m.d.

20"x48" centers LeBlond Rapid Production Lathe, m.d.

Libert No. 1236 High Speed Shear, 36" throat, circle cutting attachment

No. 12M Morey 2 spindle Profiler, m.d., with collet attachment

More than 1,000 machines in stock for prompt shipment.

THE EASTERN MACHINERY CO.

1002 TENNESSEE AVE., CINCINNATI 29, OHIO

FOR IMMEDIATE DELIVERY— PRACTICALLY NEW AND REBUILT

BORING MILLS
24", 36", 42" and 54" Bullard and Cincinnati. Late type.

MILLING MACHINES
No. 1, No. 2, No. 3, No. 4, No. 5 Vertical and Horizontal. Cincinnati, Kearney & Trecker and Brown & Sharpe.

TURRET LATHES
No. 1A, No. 2A, No. 3A, No. 4 and No. 6. Warner & Swasey.

LATHES
14", 16", 18", 20", 24", 30", 36" up to 66". American, Leblond, Hendey, etc.

PLANERS
36"x36"x16' D&H M.D. Open Side.
20"x20"x6' Ames.
48"x48"x18' Putnam, M.D.
48"x48"x14' Cleveland M.D. Open Side, Box Table.

RADIAL DRILLS
5' and 6' Bickford.
5' Carlton, 17" column. Latest Model.
4' Carlton.

SHAPERS
14", 16", 18", 20", 24", 28" Gould & Eberhardt, Smith & Mills, etc.

GRINDERS
Internal and External. Many sizes.

S & S MACHINERY COMPANY

207 CENTRE STREET — Telephone: WOrth 4-5710 — NEW YORK 13, N. Y.

GRINDERS
Lees Bradner Gear Grinder.
Simplicity Piston Grinder.
12" x 96" Landis Plain, S.C.

GEAR MACHINERY
18" Gleason Bevel Gear Generators.
6" Bilgram Bevel Gear Generator.
#4—36" B & S Automatic Gear Cutter.
Lees Bradner Gear Grinder.
#6 Fellows Gear Shaper, Cone.
#3 Adams Farwell Gear Hobber.
#2 Pfauter Gear Hobber.
#18H Gould & Eberhardt Gear Hobber.

PLANERS
42" x 42" x 20' Cincinnati Hypro, 4 Heads, D.C. drive.
72" x 60" x 28' Pond 2 heads, Belt drive.
24" x 24" x 6' Gray Planer.
26" x 26" x 8' Woodward & Powell, 2 Hds.

RADIAL DRILLS
2½' American Plain, M.D.
3' American Sensitive.
3' Cincinnati Bickford Plain Radial Drill.
4 Spindle Sipp, Power Feeds.

LATHES
18" x 8' Lodge & Shipley, 3 S.C.D. D.B.G.
22" x 10' LeBlond 3 S.C.D Q.C.
26" x 15' Pittsburgh, 3 S.C.D. Q.C.
20" x 8' Sebastian Geared Head, S.P.D.
36" x 18' Schumacher & Boye 5 S.C.D. Trip. Grd.

MISCELLANEOUS
14" Niles Slotter.
#4 Cincinnati Vert. High Power Mill, M.D.
#2B Brown & Sharpe Plain Miller, S.P.D.
#2 Cincinnati H.P. Universal Miller, S.P.D.

CINCINNATI MACHINERY & SUPPLY CO.
217 East Second St., Cincinnati, Ohio

BORING MILL:—Bertram 42". Broach-LaPointe #4W Hyd.
DRILLS:—Niles 7' Radial Cincinnati-Bickford 5', 6' Radials
GRINDERS:—Norton 6x32, 10x24, 18x96
Baxter D. Whitney #23 Cylinder Grinder, Like New
Brown & Sharpe #10, 11 Plain
Brown & Sharpe #1, 3 Univ.
Bath 10"x25" Univ.
Cincinnati 12"x36" Univ.
Bryant #18 Hole; Bryant #3B, 6, 12 Internal
P & W 14" B'y. Vert. Surface
Farrel Roll Grinder
LATHES:—Lodge & Shipley 20"x8' Selective G.H.
Johnson 30"x24'
Wickes 32"x14' Cone, M.D.
Le Swing 4"x60', 3½"x108"
J & L 2¼x24, 3x36 Flat Turret
MILLERS:—Cin. #3, 4 Plain SPD
Owens #3 Universal
Becker #4B Vertical
Cin. #4 Vertical SPD
B&S #3 Vertical SPD
Rowbottom Cam Miller
P&W 5" Automatic
Pratt & Whitney 12" Heavy Auto.
Pratt & Whitney 2" Spline Duplex
Pratt & Whitney 4½"x12", 6"x48" Thread Millers
Hanson-Whitney Thread Miller
Pratt & Whitney Gun Barrel Drillers, Reamers, Rifflers and Chamferers.
Cincinnati 12" B.G. Mfg.
Becker #7H Lincoln
PLANERS:—Cincinnati, 30"x30"x10'; 36"x36"x20'
Gray 36"x36"x10' 8 Head Planer; Gray 42x42x12
Cin. 48"x48x20', 3 Head
Fitchburg 72"x50"x25', 4 Head
Gray 84"x72"x18', 4 Head
PRESSES:—Z & H #18 Percussion
Ferracute #DGGF56 Double Geared
165 Ton Cap. 36" stroke, Weight 36000 lbs. New 1939

BOTWINIK BROTHERS, INC.
373 Welton Street
New Haven, Conn.

#4 Brown & Sharpe Universal Grinder M.D.
#14 Brown & Sharpe Plain Grinder
#11 Brown & Sharpe Plain Grinder S.P.D. with motor
8" x 30" Modern Plain Grinder M.D.
Norton 10" x 50" Rebuilt to take 72" between centers Motor drive
2 Universal Spline Grinders Fitchburg Hydraulic
Monarch 12" x 6' 3-step Cone Lathe Q.C.G Motorized
Willard 13" x 5' 3-step Cone Lathe Q.C.G. Motorized
Walcott 14" x 8' 3-step Cone Taper Q.C.G. Motorized
Monarch 14" x 8' 3-step Cone Q.C.G.
36" Betts Bridgeport Boring Mill Motorized
#2 Cincinnati Vertical Mill All P.F. Slotted Nose S.P.D. Rebuilt
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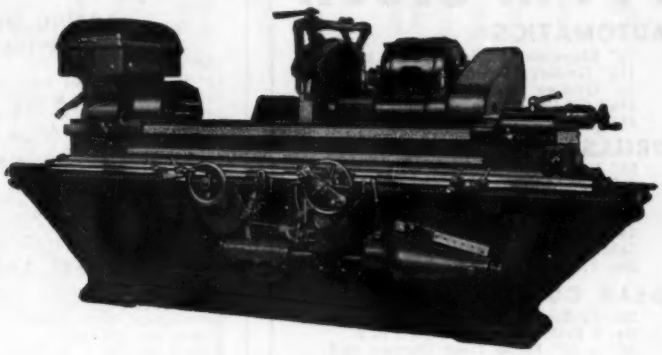

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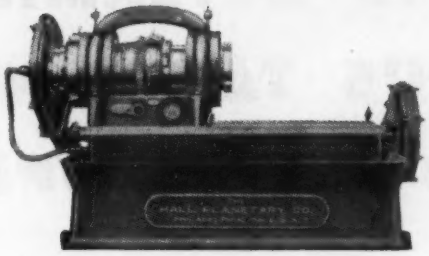

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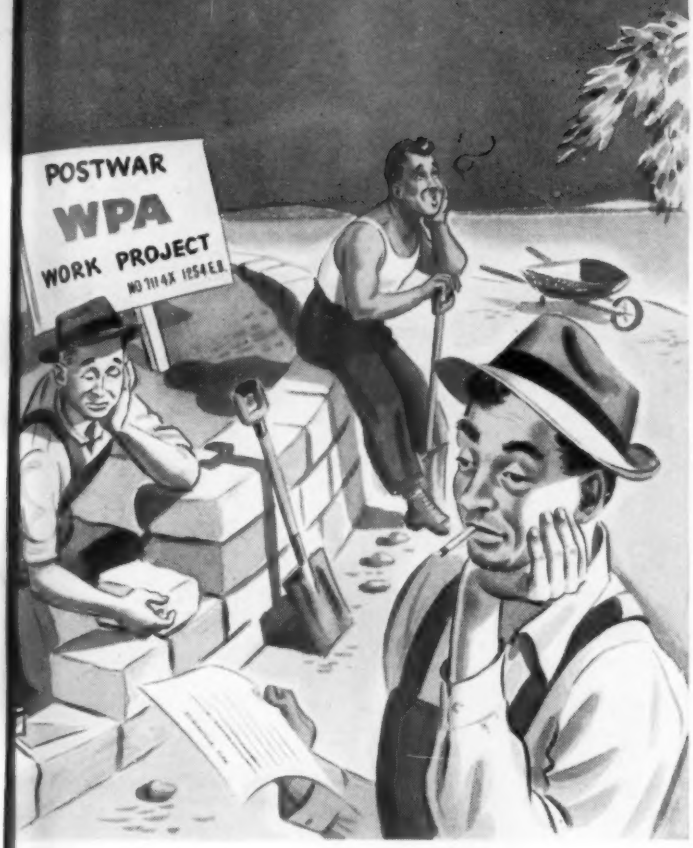

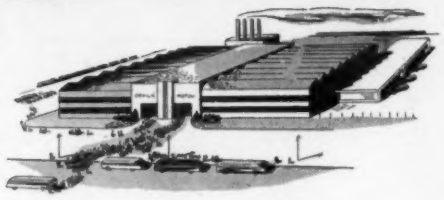

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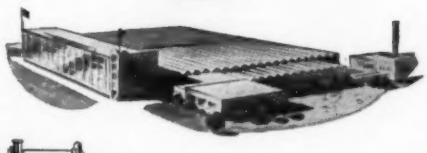

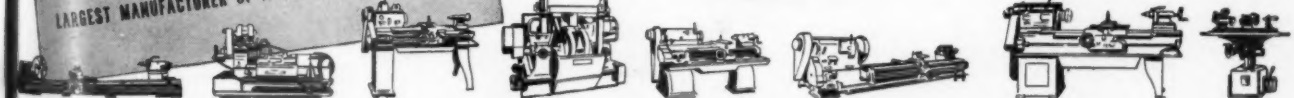

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